



Province of British Columbia
Ministry of Energy, Mines and
Petroleum Resources
Hon. Jack Davis, Minister

MINERAL RESOURCES DIVISION
Geological Survey Branch



PEATLAND INVENTORY OF BRITISH COLUMBIA

By D.E. Maynard

OPEN FILE 1988-33

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**MINERAL RESOURCES DIVISION
Geological Survey Branch**

**PEATLAND INVENTORY OF
BRITISH COLUMBIA**

**By D.E. Maynard
A Contribution to the Canada/
British Columbia Mineral Development
Agreement, 1985 - 1990**

OPEN FILE 1988-33

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Canadian Cataloguing in Publication Data
Maynard, Dennis Edward, 1949-
Peatland Inventory of British Columbia

(Open file, ISSN 0835-3530 ; 1988-33)

Bibliography: p.
ISBN 0-7718-8741-8

1. Peatlands - British Columbia. 2. Peat - British Columbia. I. British
Columbia. Geological Survey Branch. II. Title. III. Series: Open file
(British Columbia. Geological Survey Branch) ; 1988-33.

TN840.C3M39 1989

553.2'1

C89-092058-3

**VICTORIA
BRITISH COLUMBIA
CANADA
March 1989**

TABLE OF CONTENTS

	Page
EXECUTIVE SUMMARY	5
The Peat Resource	5
Peatland Inventory - Objectives and Methods	
Peatland Inventory - Results	5
Potential Uses of Peatlands.....	6
Conclusions.....	6
Recommendations	6
INTRODUCTION	9
THE PEAT RESOURCE	13
Introduction	13
Classification of Peatlands.....	13
Peat Materials and their Characteristics	14
PEATLAND INVENTORY	17
Introduction.....	17
Methods	17
Areal Extent of Wetlands and Organic Deposits in British Columbia.....	20
Distribution and Quality of British Columbia Peatlands.....	20
Coast Mountains and the Islands	20
Interior Plateau.....	24
Columbia Mountains and Southern Rocky Mountains.....	27
Northern and Central Plateaus and Mountains	27
Great Plains.....	27
POTENTIAL USES OF PEATLANDS	31
Introduction	31
Mining of Peatlands.....	31
In situ Uses of Peatlands	33
Environmental Considerations	33
PEAT RESOURCES OF BRITISH COLUMBIA.....	35
Introduction.....	35
Coastal Peat Resource	35
Interior Plateau Peat Resource.....	36
Northeast Peat Resource.....	36
CONCLUSIONS AND RECOMMENDATIONS	37
ACKNOWLEDGMENTS	39
SELECTED BIBLIOGRAPHY	41
APPENDICES	45

FIGURES

- Figure 1.** Physiographic units and subunits of British Columbia
- Figure 2.** Per cent wetlands in each 1:50 000 NTS map sheet
- Figure 3.** Per cent organics in each 1:50 000 NTS map sheet
- Figure 4.** Sources of information used to compile peatland inventory maps
- Figure 5.** Cross-sections of coastal slope bogs near Prince Rupert and on the Queen Charlotte Lowlands
- Figure 6.** Cross-sections of a flat bog on northern Vancouver Island and a stream fen on Quadra Island
- Figure 7.** Sample of a peatland inventory map, 1:250 000 NTS sheet (in back pocket)

TABLES

- Table 1.** World peat resources
- Table 2.** Levels of investigation for peat resource assessments
- Table 3.** Per cent organics in each 1:50 000 NTS map area, Cariboo - Chilcotin region
- Table 4.** Per cent organics in each 1:50 000 NTS map area, Nechako Plateau region
- Table 5.** Per cent organics in each 1:50 000 NTS map area, Peace River region
- Table 6.** Per cent organics in each 1:50 000 NTS map area, Fort Nelson region
- Table 7.** Minimum climatic requirements for use of an area for peat production
- Table 8.** Comparison of the properties of various fuels

APPENDICES

- Appendix 1.** Glossary
- Appendix 2.** Common peat landforms of British Columbia
- Appendix 3.** Modified von Post system
- Appendix 4.** List of data sources used to compile the peatland inventory
- Appendix 5.** Descriptions of representative organic soils
- Appendix 6.** Peatland Inventory Index Map and list of 1:250 000-scale peatland inventory maps. (available separately and individually from this report)

EXECUTIVE SUMMARY

THE PEAT RESOURCE

It is estimated that approximately 1 per cent of the total land area of British Columbia is covered by peatland, much of which occurs in remote areas. There has been a certain amount of development of peat deposits in populated and accessible areas; agricultural cropping is common in the southwest and central Interior regions of the province and limited mining of horticultural peat has occurred in the Fraser delta area. The overall peat resource of the province has not been studied in any detail.

The dominant peatlands of British Columbia are mainly classed as bogs or fens. Bogs are ombrotrophic peatlands with high water tables. The surface of bogs is virtually unaffected by nutrient-rich groundwater from surrounding mineral soils and thus is usually acidic and low in nutrients. Dominant materials are poorly to moderately decomposed sphagnum moss and woody peat, underlain at times by sedge peat. Fens are meadow-like, minerotrophic peatlands with high water tables. They are richer in nutrients and less acidic than bogs. Dominant materials are moderately to well-decomposed sedge or brown moss-peat of variable thickness.

PEATLAND INVENTORY - OBJECTIVES AND METHODS

The information in this report on the distribution and quality of the peat resource of British Columbia is intended to provide guidance to those wishing to investigate the possibility of developing a viable peat industry and an inventory useful to other potential users, including wildlife biologists and the farming and ranching industries. The project involved a compilation of existing resource data. No new inventories or field studies were undertaken. It is a relatively simple, time and cost-efficient method of examining the provincial peat resource which provides preliminary information upon which further studies may be based.

Peatland inventory maps are available separately at a scale of 1:250 000. Data sources were mainly provincial and federal government resource surveys, ranging in scale from 1:50 000 to 1:250 000. Peatland map units are described in a legend designed to reflect the variance in the amount of detail in original source data and yet convey base information about the quality of peat. Information readily extracted from the data sources and important in determining peat quality includes classification of peatland (fen, bog, undifferentiated), depth of deposit (greater or less than 1 metre) and degree of decomposition (poor, moderate, well). Individual map units are described by a combination of these variables.

PEATLAND INVENTORY - RESULTS

Three general regions of the province are identified by the peatland inventory as being the principal locations of the resource: central and north coast area, central Interior Plateau and northeastern Great Plains. The largest deposits occur in the northeast, although their full extent is unknown because of incomplete base-data mapping in this area. Large peat deposits also occur on certain coastal lowlands. Interior peatlands are usually smaller, but occur in clusters.

Peatlands are a common landform north of 50° latitude along a coastal strip 30 to 100 kilometres wide. The large peat deposits consist mainly of flat and slope bogs located on the Queen Charlotte Lowland, on the flat, mid-coast islands, in the Nootka Sound area and near Prince Rupert. They usually have a thin surficial cover of sphagnum moss overlying well-humified, sedge-dominated peat. On Vancouver Island and the adjacent mainland coast, peatlands are mainly undifferentiated organics and fens which are usually small in area and isolated from one another. Sedge-dominated peats are common in these areas.

Organic deposits of the lower Fraser valley are mainly moderately to well-decomposed, sedge-dominated peatlands. Exceptions include some sphagnum bogs of various sizes located on the floodplains and deltas of the Fraser and Pitt rivers.

Peatlands of the Interior Plateau are mainly fens, other sedge or brown moss-dominated organics and undifferentiated organics. Sphagnum bogs are uncommon. The north-trending core of the plateau, west of the Fraser River between Williams Lake and Prince George, has the highest concentration of organics.

Peat deposits occupy extensive tracts of level or depressional ground in the Peace River and Fort Nelson lowlands. Fairly deep sphagnum bogs predominate in these regions but fens are also common south of the Peace River. Bogs in the Fort Nelson area consist of an upper layer of partially decomposed fibric mosses overlying moss, sedge and woody peat of more advanced decomposition. Permafrost within 1 metre of the ground surface is a common feature of these extensive bogs. The Fort St. John - Dawson Creek area features clusters of contiguous and isolated bogs and fens in the south. Further north, vast level areas are nearly continuous bogs and bog-fen complexes. The bogs are similar to those in the Fort Nelson area but are unlikely to contain perennially frozen layers.

POTENTIAL USES OF PEATLANDS

Potential uses of peat are mainly as a fuel, as a horticultural product or as an in situ soil for agriculture production. Fuel or energy peat requires a high degree of humification, high bulk density, relatively low ash content, low content of potential pollutants and high calorific value. Large, deep deposits are needed to make peat extraction practical. Sedge-dominated peats are most suitable, although moderately to well-decomposed sphagnum peat is also acceptable.

Slightly humified sphagnum peat, because of its internal structure, has properties highly suitable for such uses as a horticultural soil enhancer and a filtration and absorption agent.

Well-humified, sedge-dominated peatlands form good organic soils with high nutrient values and relatively high cation-exchange values and may be suitable for in situ agricultural or forestry production. Acidic, nutrient-poor sphagnum bogs are less suited for agricultural cropping unless lime is added.

Undisturbed peatlands play an important role in water management, affecting water quantity and quality and also provide important wildlife habitat. Environmental aspects to consider when developing a peatland are drainage, habitat destruction, and groundwater and surface runoff contamination. A reclamation plan should also be developed prior to any peat mining operation so that consideration can be given to the final land use of the mined area.

CONCLUSIONS

There are large quantities of peat on the north coast of British Columbia. Good horticultural sphagnum peat occurs in some slope and domed bogs; however, in most bogs horticultural quality is limited because of high sedge content. Limitations to developing a fuel or horticultural peat industry on the north coast include high rainfall, inaccessibility and poor drainage. Accessible peat deposits of the lower Fraser valley and eastern Vancouver Island have largely been pre-empted or depleted.

Large fens and contiguous peatlands in the central Interior could provide potentially good sources of fuel peat because climate, access and transportation facilities are generally favourable. Good sources of horticultural peat are limited in this area.

Extensive peatlands of the northeast contain peat acceptable for both horticultural and fuel uses but their remote location is a major limitation to their exploitation. Climatic restrictions and the presence of permafrost in this area also severely limit peat extraction.

Agricultural use of peatlands is common in the Fraser valley, eastern Vancouver Island, central Interior and Peace River area.

RECOMMENDATIONS

The next level of study required on coastal peatlands is to better determine resource potential for possible fuel or horticultural peat sources. Large, easily accessible peatlands, such as bogs near Prince Rupert or some undifferentiated peat deposits on Vancouver Island, are suggested areas for more intensive ground evaluation.

Further work on peatlands in the central Interior and northeast should concentrate on better identifying and characterizing peatlands and ranking them according to their most suitable end use. These areas could be selected from peatland inventory maps based on peat type and characteristics, climate, and accessibility to transportation routes and potential markets. Detailed ground surveys and site-specific assessments of individual peat deposits are probably best left to individual developers and academic researchers.



INTRODUCTION

Peatlands have potential for many uses in the horticultural and fuel industries and in agriculture, forestry and wildlife conservation. Overall, British Columbia does not have extensive peat deposits. The northwest coast, central Interior and northeastern part of the province contain the most significant areas of peatland. Most of the rest of the province contains only scattered peat deposits of limited thickness and extent. It is estimated that approximately 1 per cent of the total land area of the province is covered by peatlands, but much of this is currently inaccessible.

There has been a certain amount of development of peat deposits in populated regions. Fraser delta bogs, notably Burns Bog, have been mined for horticultural moss peat. Intensive agricultural cropping has been practiced on organic deposits in the lower Fraser valley and on Vancouver Island. Fen meadows in the central Interior provide an important source of both native and cultivated hay and pasture for the ranching industry.

In recent years, many jurisdictions recognized that management decisions regarding their peatland resources were severely limited by lack of data. Consequently, a number of inventory programs were undertaken. Most of these, including surveys in Minnesota (Olson and Johnson, 1983), New York (Monenco Ontario Ltd., 1981), Newfoundland (Wells and Pollett, 1983), Manitoba (Mills, 1983; Dixon and Stewart, 1984), Ontario (Cowell and Wickware, 1983; Telford, 1983) and Quebec (Gilbert, 1983), involved interpretation of remote sensing data and aerial photographs. Field checking and more detailed mapping is following systematically in the more accessible areas of potentially significant peatlands. In New Brunswick (Keys, 1983) a very high level of peatland inventory has already been achieved. All peatlands greater than 25 hectares have been investigated and the entire province is mapped at a scale of 1:10 000.

In British Columbia little attention has been paid to the study of peatlands as potential sources of horticultural or fuel peat. Much more effort has been spent on classifying and inventorying wetlands to determine their suitability for agriculture, wildlife and waterfowl production. A recent study, as yet unpublished (Dendron Resource Surveys Ltd., 1985; Tarnocai, in preparation), is the first major work to concentrate solely on a regional identification and classification of peat deposits. Peatlands have been mapped, at a scale of 1:250 000, for the entire Pacific coast, including Vancouver Island and the Queen Charlotte Islands. Throughout the rest of British Columbia any information about peat deposits and peat materials must be extracted from existing soil, terrain and surficial geology maps. Van Ryswyk (personal communication, 1987) used soil and soil capability maps, where they exist, to calculate areas and percentages of land occupied by wetlands and organic deposits. However, his work does not identify specific locations or types of peatlands.

An up-to-date inventory of British Columbia peatlands would supply information to anyone wishing to investigate the possibility of developing a peat harvesting industry as well as provide data useful to a variety of other users including wildlife biologists and the farming and ranching industries. Under the direction of Z.D. Hora, Industrial Minerals Specialist, the Ministry of Energy, Mines and Petroleum Resources commissioned this peatland inventory with the objectives of reporting on the distribution of peatlands and on the quality of peat in British Columbia.

Peatlands are mapped at a scale of 1:250 000. Data were taken from all available sources but there was no attempt to develop new data (for example, by stereoscopic interpretation of aerial photographs). Information relevant to the peatland inventory is available for 73 of the 84 map sheets which cover the province. Peatland units are identified according to a combination of peatland class, depth of deposit and degree of decomposition. The classification depends on the quality of the original data sources; therefore, the level of detail and accuracy expressed in the peatland units is quite variable. These peatland map units are intended to express information which may be useful in determining potential use-requirements. However, use of peatlands, whether it be for in situ or mining purposes, is not implied in the mapping criteria.

This report discusses the methods used to compile this inventory of British Columbia peatlands. The main body of work is the maps themselves; they can be obtained separately from MAPS-BC, British Columbia Ministry of Environment and Parks, Victoria. A general discussion of the distribution of peatlands and the quality of peat is presented in the text. Potential uses of British Columbia peatlands are also briefly discussed; however, it should be noted that the main focus of this inventory is to identify areas of potentially significant peat deposits. Classifying and characterizing specific peat deposits requires much more detailed information. Appendix 4 of the report contains a complete list of available data sources which may provide more information regarding accurate locations and dimensions of individual peatlands and, in a few cases, detailed descriptions of stratigraphy and quality of individual peat deposits. Appendix 1 is a glossary of terms associated with peatlands and wetlands which are not otherwise defined in the text.

Figure 1 shows the major physiographic units and subunits which are referred to throughout this report. Many of the physiographic regions were originally described by Holland (1964). The southern limit of discontinuous permafrost is also shown.

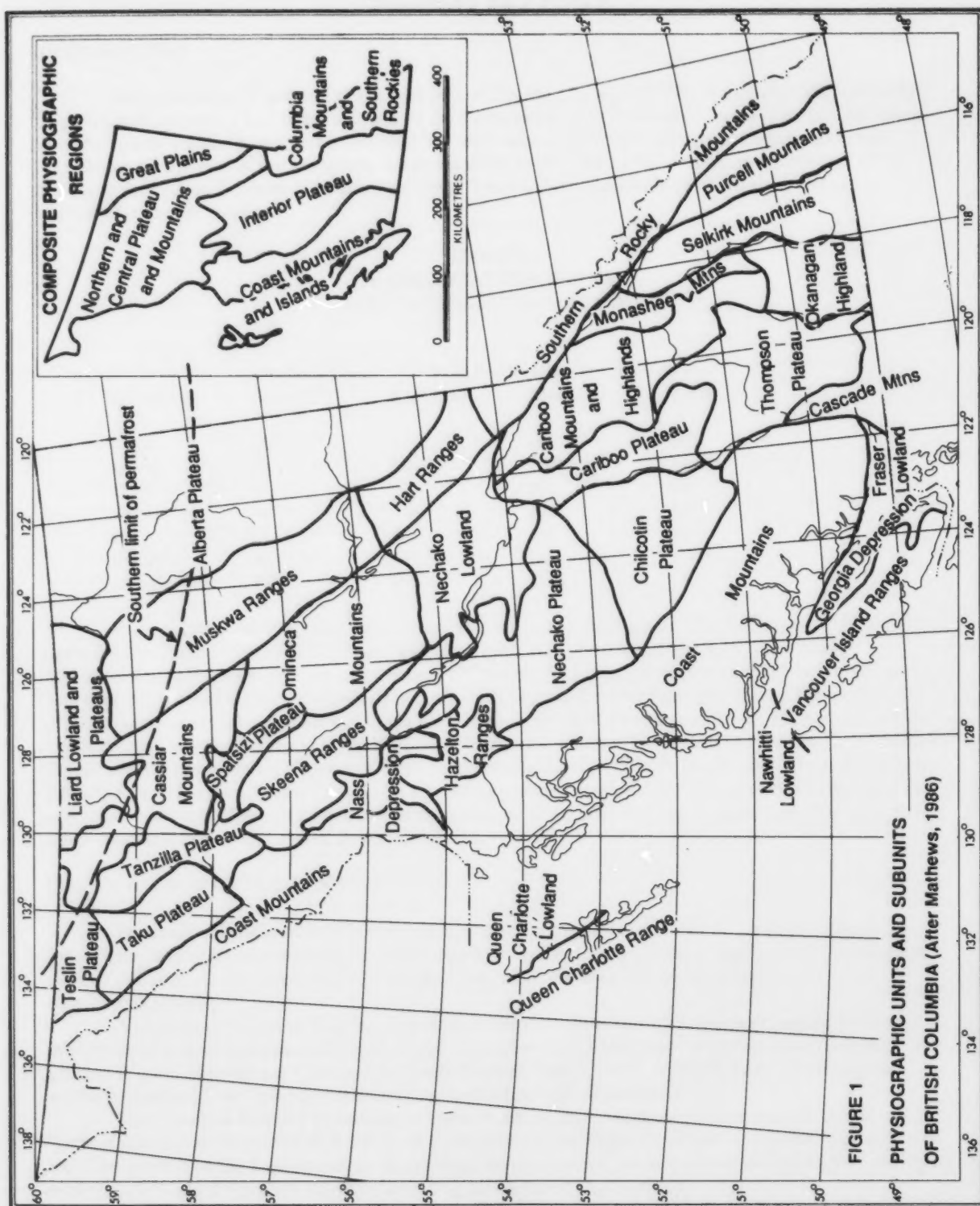


FIGURE 1
PHYSIOGRAPHIC UNITS AND SUBUNITS
OF BRITISH COLUMBIA (After Mathews, 1966)



THE PEAT RESOURCE

INTRODUCTION

Peatlands cover 12 per cent of the land area of Canada (Tarnocai, 1984); yet, despite this potentially large resource, there is a lack of information on the actual extent of peat resources in many parts of the country. A major reason for this is that peat production has never been a significant industry in Canada. Although Canada has a large part of the world peat resource (about 40 per cent), it has only about 0.2 per cent of the total peat production (Kivinen and Pakarinen, 1980). Table 1 shows estimated peatland areas and production amounts for various countries.

TABLE 1
WORLD PEAT RESOURCES
(after Kivinen and Pakarinen, 1980)

Country	Peatland Area (ha x 10 ⁶)	Peat Production (Tonnes x 10 ³)		
		Fuel Peat	Moss Peat	Total
Canada	170	-	488	488
U.S.S.R.	150	80 000	120 000	200 000
U.S.A.	40	-	800	800
Finland	10	3 100	500	3 600
U.K.	1.6	50	500	550
Ireland	1.2	5 570	380	5 950
West Germany	1.1	250	2 000	2 250

It should be noted that other workers estimate the total area of peatland in the country to be less than that shown in Table 1 (153 million hectares by Zoltai, 1980; and 129 million hectares by the Muskeg Subcommittee of the National Research Council, 1977). This discrepancy is attributed to the lack of inventory data over much of the country, particularly in northern areas. More recent data compiled by Tarnocai (1984) indicate the total area of peatlands in Canada is 111 million hectares. Almost one-quarter (22 per cent) of the total Canadian peatlands is found in the Northwest Territories, followed by Ontario (20 per cent) and Manitoba (19 per cent). Approximately 60 per cent of the total peatlands are perennially frozen (*ibid.*). Data for British Columbia show the total peatland area to be 1.3 million hectares which is 1 per cent of the Canadian total and also about 1 per cent of the total land area of the province. These figures are estimates based on inventory data which cover less than 50 per cent of British Columbia.

CLASSIFICATION OF PEATLANDS

Peatlands are wetlands in which organic accumulations (peat) are at least 40 centimetres thick. They form where dead vegetation accumulates faster than it decays. In Canada, a hierarchical wetland classification system (Zoltai, *et al.*, 1973; Tarnocai, 1980) is the most commonly used and widely accepted method of classifying peatlands.

A wetland is defined as land that is saturated with water long enough to promote aquatic processes characterized by poorly drained soils, hydrophytic vegetation and various kinds of biological activity which are adapted to a wet environment (National Wetlands Working Group, 1987). Wetlands include both organic wetlands (peatlands) and mineral wetlands (peat depths less than 40 centimetres).

The Canadian Wetland Classification System contains three hierarchical levels: class, form and type. Wetland classes are recognized on the basis of the overall genetic origin of wetland ecosystems. Wetland forms are differentiated on the basis of surface morphology, surface pattern, water type and morphology of underlying mineral soil. Wetland types are classified according to vegetation physiognomy.

The four main wetland classes include bogs, fens, swamps and marshes. The following definitions are taken from The Canadian Wetland Classification System:

Bog - A bog is a peatland, generally with the water table at or near the surface. The bog surface, which may be raised or level with the surrounding terrain, is virtually unaffected by the nutrient-rich groundwaters from the surrounding mineral soils and is thus generally acid and low in nutrients. The dominant materials are weakly to moderately decomposed sphagnum and woody peat, underlain at times by sedge peat. The soils are mainly fibrisols, mesisols and organic cryosols (permafrost soils). Bogs may be treed or treeless, and they are usually covered with *Sphagnum* spp. and ericaceous shrubs.

Fen - A fen is a peatland with the water table usually at or just above the surface. The waters are mainly nutrient-rich and minerotrophic from mineral soils. The dominant materials are moderately to well-decomposed sedge and/or brown moss peat of variable thickness. The soils are mainly mesisols, humisols and organic cryosols. The vegetation consists predominantly of sedges, grasses, reeds and brown mosses with some shrubs and, at times, a sparse tree layer.

Swamp - A swamp is a mineral wetland or a peatland with standing water or water gently flowing through pools or channels. The water table is usually at or near the surface. There is pronounced internal water movement from the margin or other mineral sources; hence, the waters are rich in nutrients. If peat is present, it is mainly well-decomposed wood, underlain at times by sedge peat. Associated soils are mesisols, humisols and gleysols. The vegetation is characterized by a dense cover of deciduous or coniferous trees or shrubs, herbs and some mosses.

Marsh - A marsh is a mineral wetland or a peatland that is periodically inundated by standing or slowly moving water. Surface water levels may fluctuate seasonally, with declining levels exposing draw-down zones of matted vegetation or mudflats. The waters are rich in nutrients, varying from fresh to highly saline. The substratum usually consists of mineral material, although occasionally it consists of well-decomposed peat. Soils are predominantly gleysols, with some humisols and mesisols. Marshes characteristically show zonal or mosaic surface patterns composed of pools or channels interspersed with clumps of emergent sedges, grasses, rushes and reeds, bordering grassy meadows and peripheral bands of shrubs or trees. Submerged and floating aquatics flourish in open water areas.

Swamps and marshes very often are mineral wetlands or contain only shallow peat deposits. The main peatlands in British Columbia are associated with the bog and fen classes. Common peat landforms occurring in the province include: basin bogs, blanket bogs, collapse-scar bogs, domed bogs, flat bogs, northern plateau bogs, palsa bogs, peat plateau bogs, slope bogs, string bogs, veneer bogs, collapse-scar fens, floating fens, horizontal fens, net fens, northern ribbed fens, shore fens and stream fens (Tarnocai, 1984). Appendix 2 describes these peat landforms in detail.

PEAT MATERIALS AND THEIR CHARACTERISTICS

Organic soils contain 17 per cent or more organic carbon (30 per cent organic matter) by weight (Canadian Soil Survey Committee, 1978). Organic material with a maximum ash (mineral matter) content of 40 per cent is an acceptable definition of peat for the fuel peat industry (Monenco Ontario Ltd., 1981). Peat materials can be adequately described on the basis of degree of humification and original botanical constituents of the peat. The organic soil order is subdivided into great groups based largely on the degree of decomposition as follows:

- Fibrisols - poorly decomposed,
- Mesisols - moderately decomposed,
- Humisols - well decomposed.

Perhaps the most comprehensive and widely used system for classifying peat material is the modified von Post system. It is used extensively throughout North America and Europe and a person with a solid background in peatland studies can interpret it for engineering, ecological, commercial and other purposes (Monenco Ontario Ltd., 1981). In the von Post system, peat is classified by using the recognizable features of its

original plant constituents. The degree of humification, indicated by the letter "H", is divided into 10 categories ranging from H1 (living organic materials, non-humified) to H10 (fully humified organic material). Further subdivision can be made based on moisture regime, fibre content and degree of woodiness. A full presentation of the modified von Post system is given in Appendix 3.

Tarnocai (1984) provided a brief description of some common peat materials found in Canadian peatlands. These are defined according to their botanical composition and include:

Sphagnum peat - This peat material is usually undecomposed (fibric), light yellowish brown to pale brown in colour, with a loose and spongy texture; the entire sphagnum plant is readily identifiable. The von Post value is generally H1 to H3 and the rubbed fibre content is approximately 60 per cent. The material has the lowest pH, ash content and bulk density (0.07 gram per cubic centimetre) of all peat materials.

Sedge peat - This peat material is dominantly composed of sedge (*Carex* spp.) and is generally moderately decomposed and matted. The sedge leaves are readily identifiable with the naked eye. This peat commonly contains large amounts of very fine roots of the above plant species. Sedge peat is very strongly acid to neutral (pH 4.5 to 7.0) and has a von Post value of H5 to H7. It has a rubbed fibre content of 8 to 30 per cent and a bulk density of 0.11 gram per cubic centimetre.

Brown moss sedge peat - This peat material is composed dominantly of sedges with lesser amounts of brown mosses of the genera *Drepanocladus*, *Calliergon* and *Aulacomnium* with both sedge and moss plants being readily identifiable with the naked eye. It is usually moderately decomposed to undecomposed (H5 to H1) and has an unrubbed fibre content of 8 to 30 per cent. It is generally strongly acid to neutral (pH 5.0 to 7.0) and has a bulk density of approximately 0.11 gram per cubic centimetre.

Woody sedge peat - This peat material is composed dominantly of sedge peat with lesser amounts of woody material. It is usually moderately decomposed (H4 to H6) with an unrubbed fibre content of 10 to 40 per cent and, in general, sedge and wood fragments are easily identifiable. It is very strongly acid to neutral (pH 4.5 to 7.0) and has an average bulk density of 0.18 gram per cubic centimetre.

Woody peat - This peat material is composed dominantly of woody materials derived from both coniferous and deciduous tree species. In general, the wood fragments are easily identifiable. Woody peat is moderately to well decomposed (H5 to H8) with an unrubbed fibre content of 5 to 30 per cent. It is strongly to slightly acid (pH 5.0 to 6.5) and has an average bulk density of 0.15 gram per cubic centimetre, although it may reach 0.21 gram per cubic centimetre in material with high wood content.

Feather-moss peat - This peat material is composed dominantly of feather mosses (*Hypnum* spp., *Hylocomium* spp. and *Pleurozium* spp.) and occasionally some woody materials derived mainly from coniferous tree species. It is moderately decomposed (H4 to H7) with an unrubbed fibre content of 10 to 60 per cent and is also very strongly to slightly acid (pH 4.5 to 6.5). The bulk density is approximately 0.12 gram per cubic centimetre, very similar to that of peats dominated by brown mosses.

Sedimentary peat - This peat material is derived from aquatic plant debris (algae, diatoms, aquatic mosses and other aquatic organic materials). The material is plastic, jelly-like, slightly sticky and is brown to grey in colour. It shrinks upon drying to form clods that are very difficult to rewet. This peat is generally well comminuted and has few plant fragments recognizable with the naked eye. It is very strongly to slightly acid (pH 4.5 to 6.5) and has a high ash content. The average bulk density is 0.13 gram per cubic centimetre, but it may reach 0.17 gram per cubic centimetre.

Amorphous peat - This peat material comprises well-decomposed plant materials that are unidentifiable with the naked eye. It is generally very strongly acid to neutral (pH 4.5 to 6.9) and has a bulk density of 0.15 gram per cubic centimetre. It is well decomposed (H6 to H10) with an unrubbed fibre content of 2 to 8 per cent.

Specific information on the physical and chemical properties of peat can only be obtained by analysing samples. The significance of some chemical and physical characteristics was discussed by Dendron Resource Surveys Ltd. (1985). Reaction (pH), a relative measure of acidity, indirectly shows the quality of peat as a horticultural product. Highly acidic peats are less desirable because they require more alkaline supplements. High cation-exchange capacity and high phosphate content are preferable for horticultural peats because fertilization requirements are reduced. A high rubbed fibre content is also desirable because of increased moisture absorption capacity and elasticity. Analytical results combined with a basic peat classification can form a basis for assessment of potential uses of peat.

A simpler classification, based on peat type and degree of humification, allows reliable preliminary assessments to be made. An example cited by Monenco Ontario Ltd. (1981) illustrates a simple method of classifying peat for either horticultural or energy purposes. Peat types are subdivided into sphagnum peat (containing greater than 50 per cent sphagnum residue) and other, non-sphagnum peat. Slightly humified peats (H1 to H4 for sphagnum and H1 to H3 for non-sphagnum) are referred to as non-energy peats. Energy or fuel peats have a higher degree of humification (H5 or greater for sphagnum and H4 or greater for non-sphagnum peat).

PEATLAND INVENTORY

INTRODUCTION

Organic soils throughout much of British Columbia have developed in depressions on the glacial landscape. Many of these hollows were post-glacial lakes and have gradually filled in with vegetation. As these sites receive groundwater and seepage flow, they remain saturated for most of the year. The local hydrology and the vegetation that is, or has been growing, controls the characteristics of the peat deposits (Valentine and Lavkulich, 1978).

In the central Interior, seepage and groundwater flow is usually neutral to alkaline because of the surrounding calcareous surficial mineral deposits. Organic soils are mainly composed of moderately well decomposed, relatively nutrient-rich sedges. Coastal organic soils are acidic, reflecting the more acid mineral soil and bedrock and the higher rainfall. Surface peat is poorly decomposed, consisting mainly of moss peat. In northeastern British Columbia, another form of raw, acid peat occurs. Large areas of poorly decomposed sphagnum peat developed on the flat, saturated ground surface where decomposition of the organic material is very slow because of the cold climate. Nutrient-poor soil water is mainly from precipitation.

Studies of peatlands in British Columbia have usually concentrated on fairly detailed characterization of individual peat deposits. An early study (Anrep, 1928) examined the commercial possibilities of producing peat litter and peat mull from selected organic deposits in the lower Fraser valley. Fraser delta peat deposits, particularly Burns Bog - a large, raised sphagnum peatland, have received the most detailed attention in the literature (Riggs and Richardson, 1938; Biggs, 1976; Hebda, 1977; Hebda and Biggs, 1981; Styan, 1981; Styan and Bustin, 1983). Site-specific data on selected north coastal peatlands have been collected and described by Moon and Selby (1982), Selby (1982), Tarnocai (1982), Dendron Resource Surveys Ltd. (1985) and Banner *et al.*, (1986). Organic soils in the farming areas of Vancouver Island were fully described by Maas (1972). Wetland research and classification have been carried out most extensively in the central Interior by Agriculture Canada and the British Columbia Ministry of Forests and Lands. Moon and Selby (1983) summarized earlier classification studies. Practical use of interior wetlands was discussed by van Ryswyk and Bawtree (1972), Runka and Lewis (1981) and the Central Interior Forage Extension Committee (1981). Wetland ecosystems have been further described by Roberts (1984), Steen and Roberts (1985), Levesque *et al.*, (1987) and Selby and Moon (in press).

METHODS

A peatland inventory program can be carried out at various levels of detail as described in Table 2. The scope of this study falls within the criteria described for Level 1. Available resource data were compiled for all areas of the province where it existed and information about peatland distribution and peat quality was extracted. The main source for identifying relevant data is the Resource Mapping Inventory (British Columbia Ministry of Environment, 1987). All soil and terrain surveys carried out in British Columbia by either federal or provincial government agencies are listed by NTS map area in this catalogue. Two personal contacts were very helpful in identifying other important sources of information not otherwise listed: Corinne Selby, Plant Ecologist, Agriculture Canada Research Station, Vancouver and H.A. Luttmerding, Senior Soil Specialist, British Columbia Ministry of Environment and Parks, Victoria. Sources of information used to compile the peatland inventory maps for this project are listed by NTS map sheet in Appendix 4 and summarized in Figure 4.

TABLE 2
LEVELS OF INVESTIGATION FOR PEAT RESOURCE ASSESSMENTS
 (after Monenco Ontario Ltd., 1981)

Level 1:	Preliminary Peatland Survey Using Maps and Information from Literature Purpose is to provide preliminary maps of peatland distribution everywhere that resource surveys have been carried out. Characteristics and quality of peat can be obtained from existing literature.
Level 2:	Peat and Peatland Survey by Aerial Photography and Other Remote Sensing Techniques Purpose is to identify all peat deposits by using aerial photographs as the main source of information. There are two uses for this level of inventory: small-scale photography can be used to map peatlands in areas where no other inventory data exists, and larger scale photography can be used to gather more detailed information on peatlands mapped at Level 1. Photo-interpretation combined with selective field checking provides data to infer ranges of peat thickness and distribution of peat types which can be used to calculate preliminary figures on the overall peat resource.
Level 3:	Detailed Ground Surveys Purpose of this step is to select a number of deposits for final development. It usually follows a Level 2 survey (but may also be done concurrently) and concentrates on areas found suitable for further investigation. Work involves sampling on a semi-detailed grid pattern to obtain data relating to the suitability of the deposit for development. Information collected includes size of deposit, distribution, quantities and qualities of peat types, basic chemical and physical properties, and drainability. Access and land ownership are also important factors to determine at this stage.
Level 4:	Site-specific, Project-oriented Assessments Purpose is to establish a proper drainage plan and the most efficient mining plan. Work involves a detailed grid sampling assessment of peat thickness and distribution of peat types and an accurate surface elevation survey. A large number of samples (e.g., one core per 10 hectares) needs to be taken for chemical and physical analyses to facilitate planning the mining sequence.

The peatland inventory maps were compiled and are available separately at a scale of 1:250 000. Soil and soil and landform maps at scales of 1:100 000 or 1:125 000 were the most common source of data. Soil capability for agriculture maps (1:125 000) were used to augment this information and were the only data source available for a few map areas. Terrain and surficial geology maps at scales ranging from 1:100 000 to 1:126 720 were also used to augment soil and soil capability mapping and to fill gaps in the data. Large-scale (1:20 000 to 1:50 000) soil, terrain and agricultural capability maps were only used for small areas where no other data source existed. Small-scale (1:250 000) maps of generalized terrain, surficial materials and soil landscapes are the main sources of information in the northwest of the province. The preliminary 1:250 000-mapping of peatlands of the Pacific coast by C. Tarnocai (in preparation) was the principal database for a large region. This was the only data source which was restricted to organic deposits. On all other base-data maps, organic units had to be identified and extracted from the mosaic of other interconnected map units. Forest cover and forest inventory maps, which cover most of the province at a scale of 1:50 000, were not consulted for this study.

Source data on the quality of peat deposits is highly variable. Soil maps, particularly those accompanied by reports, may identify peatlands as bogs or fens or supply data on the degree of decomposition and average depth of deposits. Northern peatlands containing permafrost are also identified. The maps of Peatlands of the Pacific Coast are also reliable at their scale of presentation. Peat deposits are classified as bog, fen or undifferentiated organic with depths identified in places. Other map sources provide less information. Soil and landform maps and soil landscape maps usually show organics as either fribisols or mesisols with no depth

estimates. Terrain and surficial geologic maps may differentiate bogs and fens, and estimate depths, but usually their reliability is limited to identifying organics as undifferentiated. Soil capability for agriculture maps simply show organic soils with no information about depth or degree of decomposition.

A map legend was produced which reflects the variation in detail of source data and yet conveys basic information about the quality of peat which may be helpful in assessing economic potential including classification of peatland (fen, bog, undifferentiated), depth of deposit (greater or less than 1 metre) and degree of decomposition (poor, moderate, well; fibric, mesic, humic) (C. Selby and H.A. Luttmerding, personal communications, 1988). Map units which are identified on the peatland inventory maps are as follows:

- O - undifferentiated organic; no information about depth or degree of decomposition.
- O1 - undifferentiated organic; poorly to moderately decomposed, no depth information.
- O2 - undifferentiated organic; moderately to well decomposed, no depth information.
- Ov - shallow undifferentiated organic (40 to 100 centimetres of peat); degree of decomposition unknown.
- Ob1 - greater than 1 metre, poorly to moderately decomposed undifferentiated organic.
- Ob2 - greater than 1 metre, moderately to well-decomposed undifferentiated organic.
- B - bog of undetermined depth (mainly ranging from 40 to 300 centimetres); sphagnum moss surface usually overlies moderately to well-decomposed organic material.
- Bs - slope bog of variable depth (mainly ranging from 40 to 350 centimetres, average depth greater than 2 metres) mantling coastal slopes of 10 to 50 per cent gradient; sphagnum moss surface usually overlies moderately to well-decomposed organic material.
- Bv - shallow bog (40 to 100 centimetres) of sphagnum moss which may or may not overlie moderately to well decomposed organic material.
- Bb - deep bog (greater than 1 metre) consisting of a sphagnum moss surface of variable thickness usually overlying moderately to well-decomposed organic material.
- F - fen of undetermined depth (mainly ranging from 40 to 250 centimetres); moderately to well-decomposed, sedge-dominated peat or poorly to moderately decomposed, brown-moss-dominated peat overlying moderately to well-decomposed organic material.
- Fv - shallow fen (40 to 100 centimetres) of moderately decomposed, sedge-dominated peat.
- Fb - deep fen (greater than 1 metre) consisting of moderately to well-decomposed, sedge-dominated peat or poorly to moderately decomposed, brown-moss-dominated peat overlying moderately to well-decomposed organic material.
- FB - fen-bog complex of variable depth and degree of decomposition; characteristics described for both fens and bogs occur and depths likely range from 40 to 300 centimetres.

In certain areas modifying symbols are attached after the peatland symbol and are used to describe special conditions affecting a particular peat deposit. These are:

- X - frozen peatland - used in northern areas where soil survey data indicate that discontinuous permafrost commonly occurs within 1 metre of the surface of organic deposits.
- D6 - peatland disturbed by mining - used on producing peat deposits in the Fraser delta (for example, Burns Bog) which have been extensively altered by peat extraction.

All the mapped information taken from the base data was plotted directly onto 1:250 000 topographic maps. Because of scale differences and the necessity to generalize some data, areas where a number of smaller peatlands occur in clusters are not separated on the maps, but the density within a given map polygon is indicated (for example, Bb⁶ indicates that 60 per cent of a map polygon is occupied by deep bogs). Peatlands covering less than 50 hectares are indicated by a dot (.). Peatland symbols may be attached to these small deposits if information is available to classify them; if no symbol is present, the dot indicates a small, undifferentiated organic deposit. The legends attached to each 1:250 000 map also contain a listing, by NTS area, of the sources of data used in the compilation as well as additional sources which may provide more detailed information.

The peatland inventory maps are available separately from MAPS-BC, British Columbia Ministry of Environment and Parks, Victoria. Figure 7 (in back pocket) is an example of one of the 1:250 000 peatland inventory maps.

AREAL EXTENT OF WETLANDS AND ORGANIC DEPOSITS IN BRITISH COLUMBIA

A. van Ryswyk of the Agriculture Canada Research Station in Kamloops (personal communication, 1987), has compiled an impressive database on the areal extent of wetlands for the entire province and of organic soils for part of British Columbia. He used soil survey maps, Canada Land Inventory Soil Capability for Agriculture maps and 1:50 000 National Topographic Survey maps to calculate, among a number of variables, total area and per cent area occupied by wetlands for each 1:50 000 map sheet in the province (1186 map sheets covering 102.4 million hectares). Total wetland area (including organic soils, gleysolic soils, and undifferentiated swamps and marshes) is 5.9 million hectares which makes up 5.8 per cent of the provincial land area. Figure 2 displays the per cent wetlands occurring in each 1:50 000 map area.

Of more specific application to this project is a second compilation by van Ryswyk. For each 1:50 000 map sheet where soil survey or soil capability maps are available, he has calculated areal extent and per cent area of organic deposits. When he did his compilation, these data were available for 451 map sheets covering 38.3 million hectares. Figure 3 illustrates per cent organic soils in each 1:50 000 map area. Organics cover 5.3 per cent (2.0 million hectares) of the inventoried area.

Figures 2 and 3 confirm that the three main regions for wetland and peatland occurrences are the central and north coast, the central Interior and the northeast plains. Coastal peatlands commonly cover greater than 40 per cent of the land area on many of the map sheets. A large area of the central Interior contains between 1 and 5 per cent organic deposits. This reflects the large plateau surface dotted by numerous, relatively small peatlands. A north-trending core of the plateau, west of Fraser River between Williams Lake and Prince George, has a higher concentration of organics (up to 10 per cent of each map sheet). In the northeast, organic deposits become more prevalent northward from the Peace River. Map sheets in the Fort Nelson Lowland show per cent organics of 10 to greater than 40 per cent. The distribution of wetlands (Figure 2) also suggests that organic deposits are equally extensive on adjacent map sheets to the east (94I and 94P). In the northwest, just south of the Yukon border, there are also some map sheets showing 10 to 40 per cent wetlands. It should be noted that any organic deposits in the extreme northern regions probably contain permafrost.

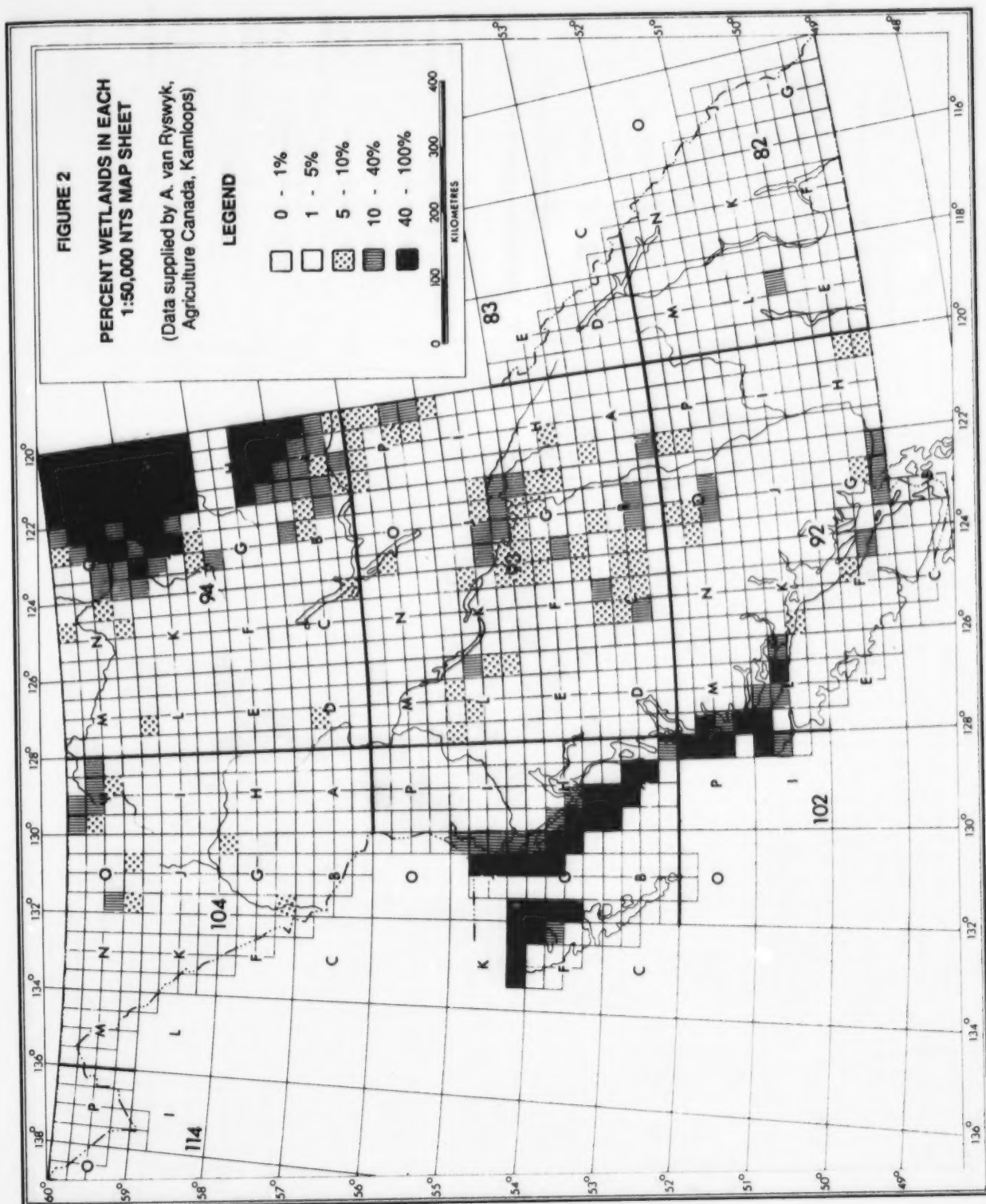
The distribution of wetlands does not necessarily reflect the occurrence of organic deposits, however, if the per cent total wetland is low then it is expected that the per cent organic figure will also be low. Therefore, from Figure 2, it is apparent that, despite the lack of data in Figure 3, the following areas have very low potential for the occurrence of extensive peatlands: mountains and plateaus of the Queen Charlotte Ranges, Vancouver Island Ranges and Coast Ranges; Cassiar and Omineca mountains; Skeena, Muskwa and Hart ranges; Rocky Mountains; Selkirk, Monashee and Purcell mountains; and the southern Okanagan Highland and Thompson Plateau. Recently published soil survey maps, not available when van Ryswyk compiled his work, provide more detailed data and, in several cases, show more organic deposits in some areas than is suggested by the generalized wetland maps (for example, NTS map area 93N).

DISTRIBUTION AND QUALITY OF BRITISH COLUMBIA PEATLANDS

Coast Mountains and the Islands

Characteristics of coastal peat deposits vary depending on their location. The widespread peatlands of the outer north coast and Queen Charlotte Islands are mainly composed of surface fibrisols with vegetation of undecomposed sphagnum, yellow cedar, shore pine and Labrador tea. Reaction (pH) values of the peat are often less than 4.0 and water input is dominantly from precipitation (Jungen and Lewis, 1978). Mesic and humic deposits have a vegetation cover of sedges, hardhack, mosses, willows, grasses and reeds. Water comes mainly from seepage inflow from adjacent mineral soils and is rich in nutrients. These peat deposits occur in drier subregions such as the eastern coastal plain of Vancouver Island and have been widely cultivated (*ibid.*).

Recent work on coastal peatlands (Tarnocai, 1982; Dendron Resource Surveys Ltd., 1985; Banner *et al.*, 1986; Tarnocai, in preparation) provide good level 2 inventory data for the entire outer coast, including the Queen Charlotte Islands and Vancouver Island. This work shows that peatlands are a common landform north



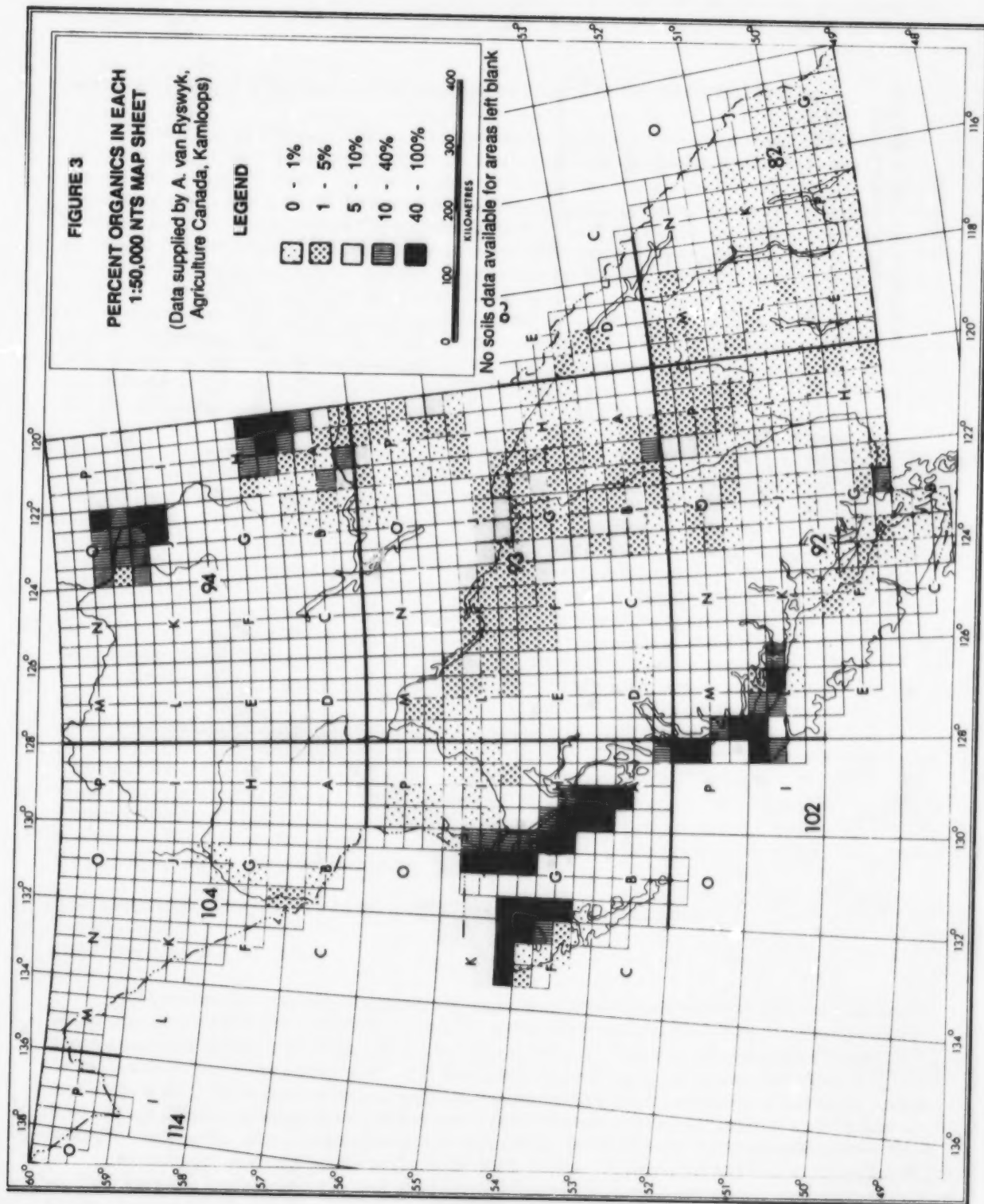
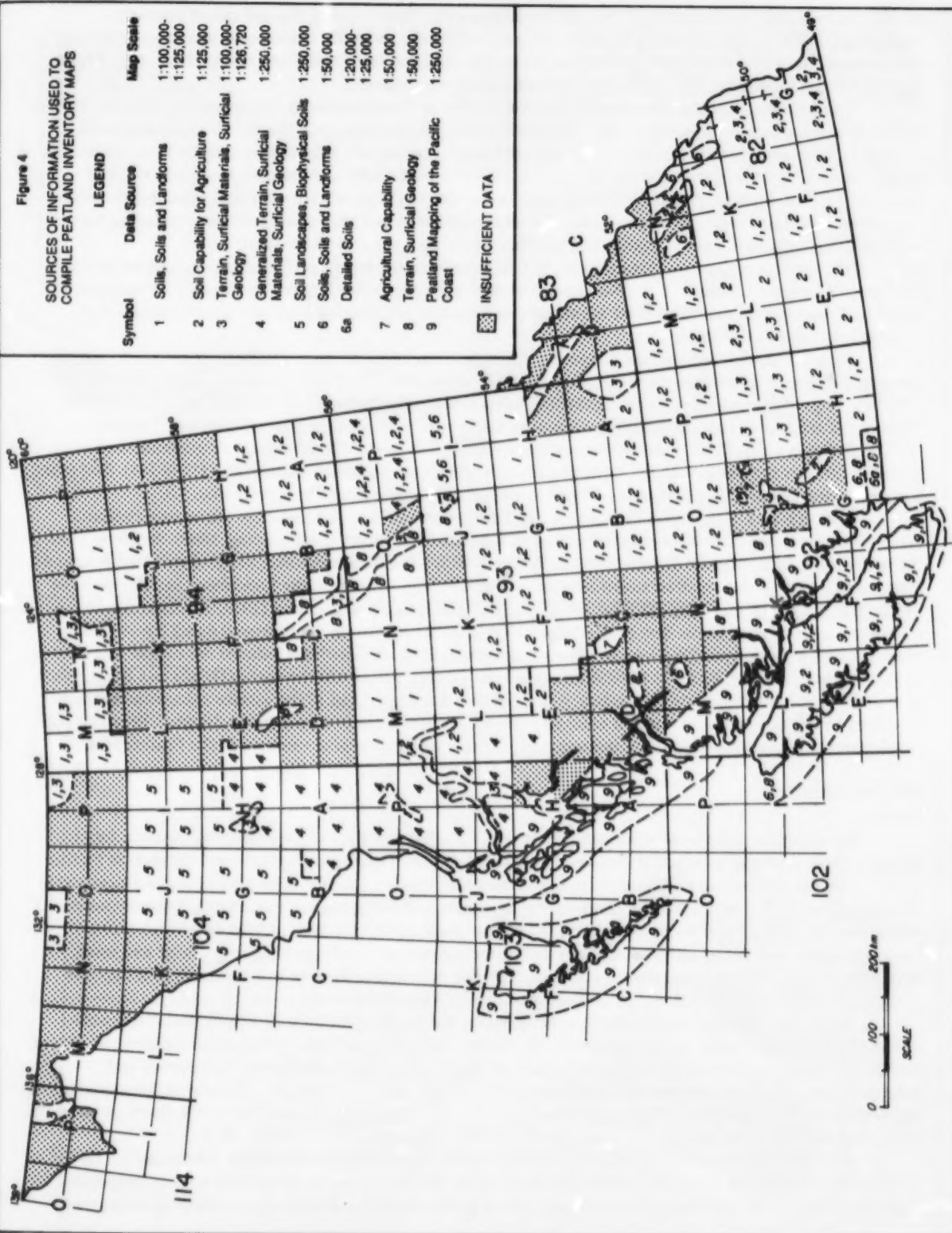


Figure 4
SOURCES OF INFORMATION USED TO
COMPILE PEATLAND INVENTORY MAPS

LEGEND

Symbol	Data Source	Map Scale
1	Soils, Soils and Landforms	1:100,000- 1:125,000
2	Soil Capability for Agriculture	1:125,000
3	Terrain, Surficial Materials, Surficial Geology	1:100,000- 1:126,720
4	Generalized Terrain, Surficial Materials, Surficial Geology	1:250,000
5	Soil Landscapes, Biophysical Soils	1:250,000
6	Soils, Soils and Landforms	1:50,000
6a	Detailed Soils	1:20,000- 1:250,000
7	Agricultural Capability	1:50,000
8	Terrain, Surficial Geology	1:50,000
9	Peatland Mapping of the Pacific Coast	1:250,000

INSUFFICIENT DATA



of 50°N latitude along a coastal strip 30 to 100 kilometres wide. Depressional, flat and raised bogs are widespread on flat and gently rolling lowlands; sloping and blanket bogs are common on gentle to moderately steep slopes (10 to 50 per cent). Fens occur on the margins of bays, lakes and slow-moving rivers and streams. Figures 5 and 6 show some typical cross-sections of coastal peat deposits.

The following discussion of coastal peat distribution and characteristics is summarized from the report by Dendron Resource Surveys Ltd. (1985). Peatlands cover 206 775 hectares in the Pacific coast study area (Figure 4). Bogs represent 82 per cent of the total peatland area and are located primarily on coastal lowlands of the Queen Charlotte Islands, the northwest coast of Vancouver Island and the mainland coast north of Vancouver Island. Undifferentiated peatlands are distributed over the southern mainland coast and the rest of Vancouver Island and make up 14 per cent of the total peatland area. Other peat landforms, including fens and fen-bog complexes, have limited distribution and the remaining 4 per cent of the total.

The large peat deposits (greater than 5000 hectares) consist mainly of flat and slope bogs located on the Queen Charlotte Lowland, in the Nootka Sound area and near Prince Rupert. Peatlands on Vancouver Island and the adjacent mainland coast are smaller and deposits are isolated from one another rather than forming large peatland mantles.

Bogs are moderately shallow (mean depths range from 1.6 to 1.9 metres); flat bogs are predominantly composed of poorly decomposed sphagnum peats overlying well-humified amorphous and sedimentary peats and slope bogs mostly contain surficial sphagnum-moss peats overlying amorphous, sedge and sedimentary layers. Fens are mainly characterized by sedge-dominated peats with mean depths greater than 2 metres.

Sedge is a significant peat component in most coastal deposits. All peat types are generally well humified (greater than H4), with the exception of some sphagnum and other moss peats (H2 or H3). Bog peat is characteristically acidic (less than pH 4.5) while the pH of fen peat is usually greater than 5.0.

Peat deposits of the lower Fraser valley and delta were not mapped as part of the coastal peatland survey. However, they have been mapped as part of a detailed soil survey (Luttmerding, 1980). As for most of the south coast, these organic deposits are mainly moderately to well-decomposed, sedge-dominated peatlands. Exceptions include some small to moderate-sized sphagnum bogs located on the floodplains and deltas of the Fraser and Pitt rivers, including the large Burns Bog in Delta municipality. Anrep (1928) reported that the sphagnum moss layer of Burns Bog once covered 1900 hectares, varying in depth from 0.6 to 3.0 metres and overlying well-humified peat. Various land uses encroaching from all sides have reduced the overall size of Burns Bog from an early estimate of 4856 hectares to its present size of 4000 hectares (Hebda and Biggs, 1981). Within the sphagnum moss core of the bog, it is estimated that 40 per cent of the surface sphagnum has been disturbed by extraction of horticultural moss peat (*ibid.*). Smaller scale peat operations, farming, fires and urban development have destroyed much of the remaining natural sphagnum moss resource in the Fraser delta.

Interior Plateau

Soil mapping has been carried out over much of the Interior Plateau, providing high quality data for this part of the peatland survey. The Interior Plateau includes the Okanagan Highland and Thompson Plateau in the south, the Cariboo and Chilcotin plateaus in the central region and the Nechako Plateau and Lowland in the north (Figure 1). The drier south contains few large peatland areas; organic materials are usually isolated along some floodplains and in depressions on the plateau surface. The Cariboo - Chilcotin and southern Nechako regions are dominantly flat to gently rolling terrain with numerous peat deposits, large and small, occupying poorly drained depressions. At the northern end of Nechako Plateau and Lowland, peat deposits occur much less frequently and mainly on floodplains and subdued lowlands.

Soil water plays an important role in determining the nature of interior peatlands. Relatively well-decomposed mesisols occur on the calcareous-till plateau where seepage water is neutral to alkaline and rich in nutrients. Vegetation consists of sedges, bog glandular birch, willows, and occasional black spruce and lodgepole pine. Poorly decomposed fibrisols occur in the more acidic environments in some of the southeastern highlands and on the plateau northwest of Prince George. These organic soils have lower pH, lower nutrient status, and support more mosses and fewer shrubs and trees (Valentine and Dawson, 1978).

Soil survey information identifies most of the central Interior peatlands as fens containing poorly to moderately decomposed sedge and/or non-sphagnum (brown) moss peat, moderately to well-decomposed sedge-dominated peat, and undifferentiated organics. The distribution and types of peatlands occurring

Figure 5

Cross sections of coastal slope bogs. Upper section is along the slope of a bog near Prince Rupert. Lower diagram is a section perpendicular to the slope of a bog on the Queen Charlotte lowlands. Sample sites are identified by numbers (From Tamocai, 1982).

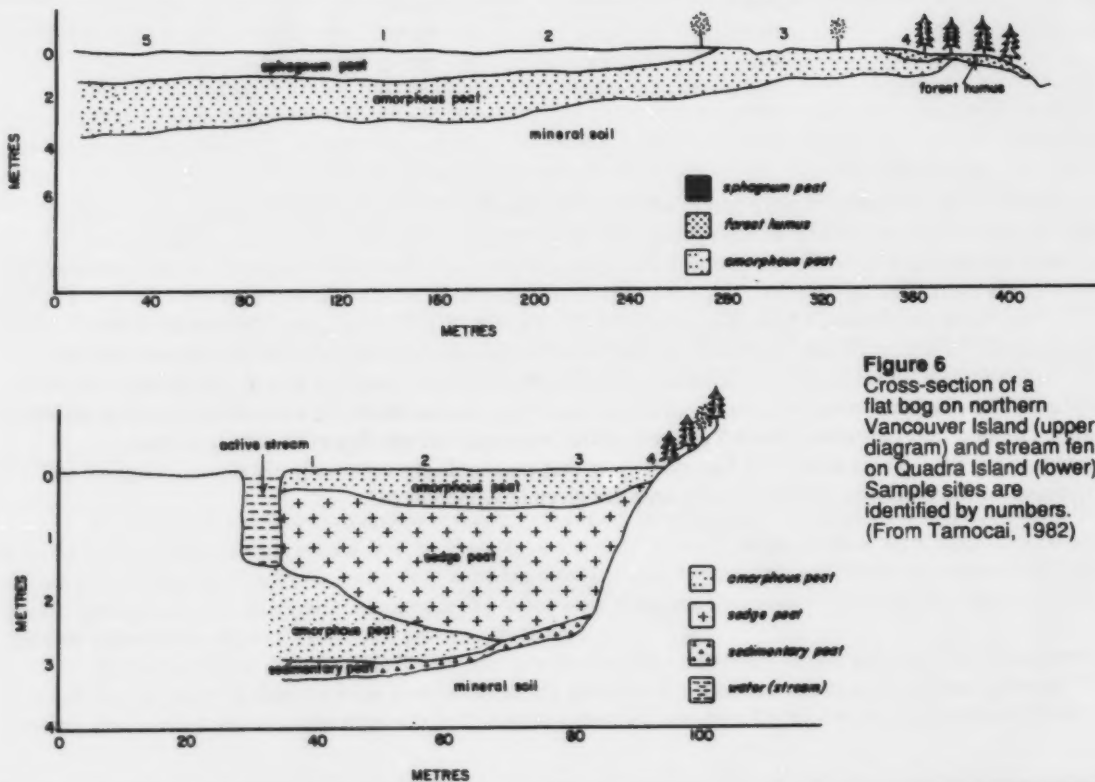
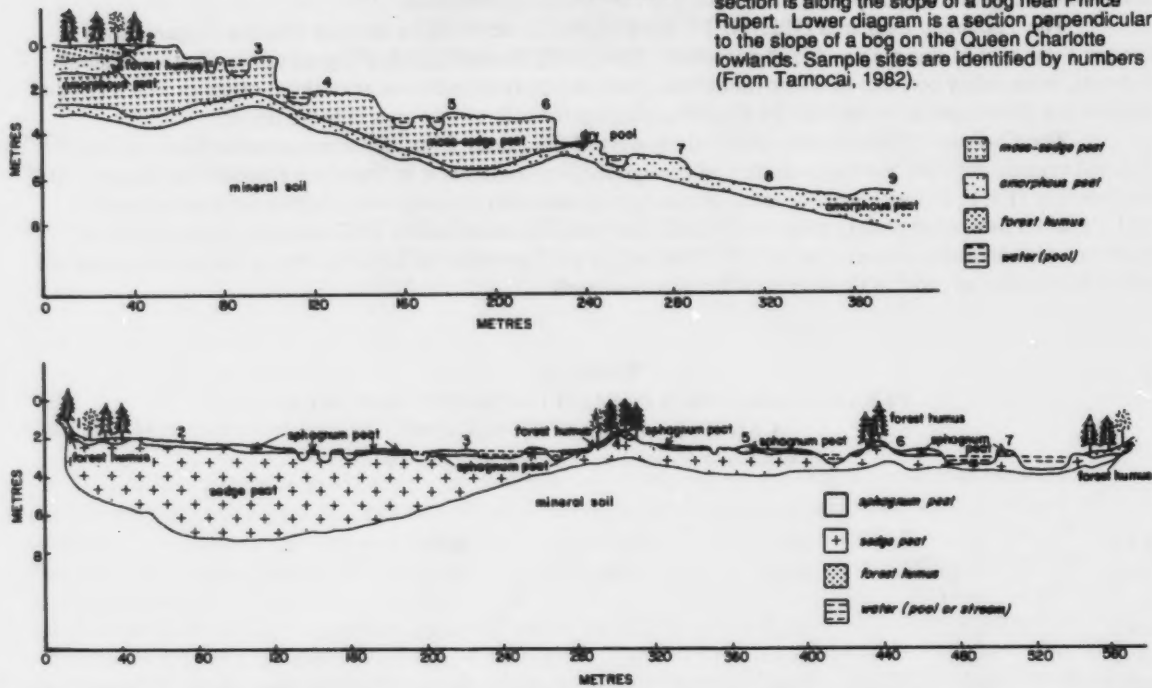


Figure 6
Cross-section of a flat bog on northern Vancouver Island (upper diagram) and stream fen on Quadra Island (lower). Sample sites are identified by numbers. (From Tamocai, 1982)

throughout the central Interior can be characterized by soil survey data from selected areas. Appendix 5 contains more detailed site-specific data related to the following discussion.

The Tulameen map area (92H/NE) is fairly typical of the southern Interior Plateau. Organic soils occupy 1 per cent of this map area and are widely distributed, as small isolated deposits or in clusters of small deposits, from valley bottoms to above timberline. This inventory classifies most of these organics as fen (F) and shallow fen (Fv) deposits. Appendix 5A describes the organic soils of this area in more detail.

The Cariboo - Chilcotin area, particularly west of the Fraser River, features extensive areas of small isolated organic deposits and large clusters of contiguous peatlands. Most of these are classified as deep to shallow fens (Fb, F, Fv) with smaller areas of poorly to moderately decomposed, undifferentiated organics (O1). Table 3 lists selected data from van Ryswyk (personal communication, 1987; *also see* Figure 3) which show per cent organics occurring in each 1:50 000 map area. Appendix 5B describes two of the common organic soils which make up most of these central Interior peatlands.

TABLE 3
PER CENT ORGANICS IN EACH 1:50 000 NTS MAP AREA,
CARIBOO - CHILCOTIN REGION
(A. van Ryswyk, personal communication, 1987)

NTS Map	% Organics	NTS Map	% Organics	NTS Map	% Organics
92O/5	3.7	93A/3	4.1	93G/3	3.5
92O/6	9.2	3A/4	2.1	3G/4	5.1
92O/7	8.6	3B/6	.4	3G/5	9.5
92O/11	4.2	3B/7	.7	3G/9	5.3
92P/7	4.1	3B/8	.5	3G/10	4.4
92P/11	4.0	3B/11	.0	3G/12	6.4
92P/12	5.9	93B/12	9.3	93G/13	5.7
92P/13	6.1	93B/14	5.2	93G/14	4.8
				93G/16	4.7

Most of the Nechako Plateau and Lowland is also characterized by extensive areas of small isolated organic deposits and large clusters of contiguous peatlands. Organics are mainly mapped as either poorly to moderately decomposed or moderately to well-decomposed, deep undifferentiated organics or undifferentiated organics of undetermined depth (Ob1, O1, Ob2, O2). Some peatlands are classified as fens (F).

The Nechako - Francois Lake map area (93F/N 1/2, 93K/S 1/2) is typical of the terrain of the northern Interior Plateau. Organic deposits are scattered throughout the entire area in depressions and filled ponds in the till plain, in kettle holes in ablation and outwash materials, along flat, marshy lakeshores and on floodplains. The peatlands occur in a variety of shapes and range in area from a few hectares to several hundred hectares. Organic soils only cover about 2 per cent of this map area but van Ryswyk's data (personal communication, 1987; Table 4, *also see* Figure 3) show that peatlands are not evenly distributed. Organic soil descriptions for the Nechako - Francois Lake area are given in Appendix 5C.

TABLE 4
PER CENT ORGANICS IN EACH 1:50 000 NTS MAP AREA,
NECHAKO PLATEAU REGION
 (A. van Ryswyk, personal communication, 1987)

NTS Map	% Organics	NTS Map	% Organics	NTS Map	% Organics
93F/9	7.1	93J/4	4.1	93K/6	3.5
93F/10	3.6	93J/5	8.4	93K/9	5.8
93F/12	3.8	93J/6	6.0	93K/12	4.5
93J/2	5.1	93J/7	3.8	93L/9	8.5
93J/3	6.6	93L/15	4.6		

Columbia Mountains and Southern Rocky Mountains

Soil and terrain mapping covers the southern half of this region; the very mountainous area to the north is not mapped (Figure 4). Organic soils are scattered in small pockets along some floodplains and valley lowlands. Water-tolerant grasses and sedges are the main types of vegetation (Wittneben and Lacelle, 1978). Peat deposits occupy an extremely low proportion of this physiographic region. Data supplied by van Ryswyk (personal communication, 1987) show that the average density of peat deposits is much less than 0.5 per cent: 82F, 0.05 per cent; 82G, 0.03 per cent; 82K, 0.01 per cent; 82M/E 1/2, 0.34 per cent (*also see* Figure 3). These organic soils are not well described in soil survey reports. They are mostly moderately to well decomposed with some poorly to moderately decomposed deposits of variable thickness. They are designated as undifferentiated organics (O) on the peatland inventory maps.

Northern and Central Plateaus and Mountains

This large region contains most of the area not covered by base-data sources (Figure 4). Van Ryswyk found little data from this region (Figure 3); however, more resource information has become available recently and were used for this study. Within the southern Hart Ranges there are scattered organic deposits along most of the major valley lowlands and floodplains (for example, Fraser, McGregor, Herrick, Parsnip and Homineka rivers). These are mainly mapped as poorly to moderately decomposed undifferentiated organics (O1), but there are a significant number identified as sphagnum bogs (B) with a lesser number of fens (F). The Skeena and Omineca mountains are poorly mapped but limited data indicate that undifferentiated organics (O) and shallow undifferentiated organics (Ov) occur as isolated deposits or as clusters of small isolated deposits in some broad valley bottoms. Within the Stikine Plateau and Liard Lowland, there are larger clusters of isolated and contiguous peatlands which mainly range from deep to shallow, moderately to well-decomposed undifferentiated organics (Ob2, O2, Ov). In places, some of the plateau and lowland peat deposits have been identified as perennially frozen (Ob2-X).

Great Plains

Much of this northeastern region remains unmapped; however, there is good soils information in the Fort St. John - Dawson Creek area and the Fort Nelson area (Figure 4). In the former area, organic soils are dominantly sphagnum bogs with lesser fens covering interdrumlin depressions and flat-lying outwash and till plains. Sphagnum peat also predominates in the latter area, covering the extensive, gently sloping plain with at least 60 centimetres of peat, much of it perennially frozen.

Mesic and fibric organic soils in this area are moderately to strongly acidic and very low in nutrients; most of the soil water is derived from precipitation. Mesisols have a vegetation cover of sedges, hypnum mosses, blueberries and bog glandular birch. Sphagnum mosses, common Labrador tea, and stunted black

spruce and tamarack grow on the fibrisols. Organic cryosols commonly occur on the Fort Nelson lowland. These are organic soils which have permafrost within 1 metre of the ground surface and consist of poorly decomposed, fibric organic matter with a vegetation cover similar to the unfrozen fibric landscape.

The Fort St. John - Dawson Creek area features large clusters of contiguous bogs and fens and smaller isolated bogs and fens in the south (Bb, B, Fb, F), but further north, huge level areas are nearly continuous bogs and bog-fen complexes (Bb, B, FB). Table 5 lists selected data from van Ryswyk (personal communication, 1987; *also see* Figure 3) which show per cent organics occurring on various 1:50 000 map sheets in this area.

TABLE 5
PER CENT ORGANICS IN EACH 1:50 000 NTS MAP AREA,
PEACE RIVER REGION
(A. van Ryswyk, personal communication, 1987)

NTS Map	% Organics	NTS Map	% Organics	NTS Map	% Organics
93I/16	6.2	93A/8	7.9	94H/1	67.0
93P/1	9.5	93A/9	27.3	94H/2	52.1
93P/9	4.0	93A/10	6.5	94H/3	17.9
93P/14	5.8	93A/14	4.6	94H/6	23.1
93A/3	13.0	93A/15	32.1	94H/7	26.8
93A/4	7.1	93A/16	53.8	94H/8	43.7
93A/5	18.4				

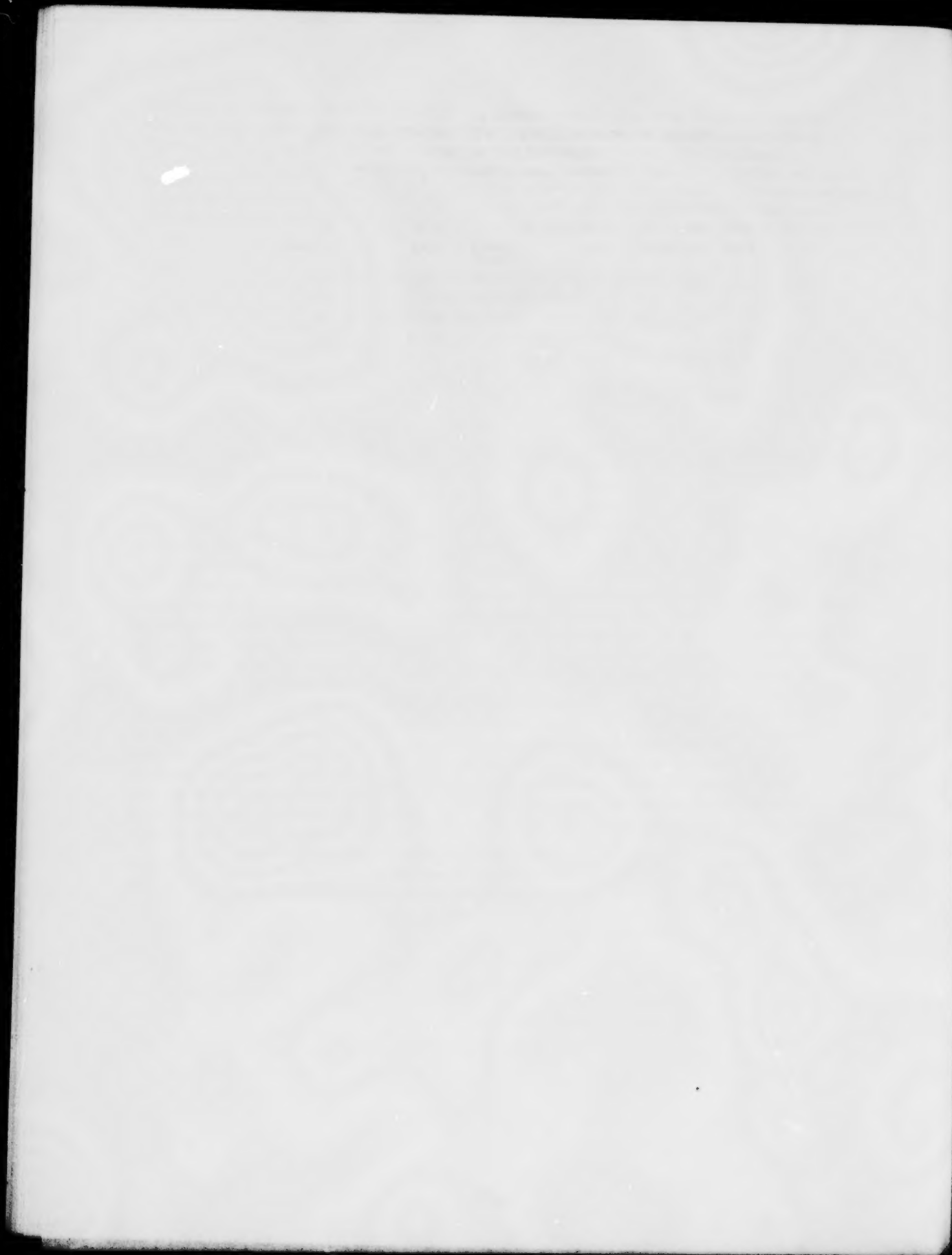
The sphagnum bogs are usually from 1 to 2 metres thick and dominated by strongly acidic peats with fibric surface layers and somewhat more decomposed subsurface horizons. Frost sometimes persists in subsurface peat layers into late summer. Fens are formed mainly of sedge peats and also are commonly 1 to 2 metres thick. They are dominated by moderately decomposed, acidic sedge materials that tend to become less acid and more decomposed with depth. Appendix 5D describes profiles of two of the common organic soils occurring in the Peace River area.

The Fort Nelson map area (94J/NE) typifies the terrain occurring in the extreme northeast of the province. Although most of the surrounding area has not been mapped, peatland distribution is very similar throughout this region. On the peatland inventory maps the organic soils are mainly classified as deep undifferentiated organics ranging from poorly to well decomposed (Ob1, Ob2). Most of these can be classed as sphagnum bogs as they consist of an upper layer of partially decomposed hypnum and sphagnum mosses overlying moss, sedge and woody peat of more advanced decomposition. This area lies at the southern fringe of the discontinuous permafrost zone (Figure 1). One of the common organic soils occurring in the Fort Nelson area is described in Appendix 5E.

Peat deposits in this map area occur as large clusters of contiguous deposits in the west, but further east, large level areas are nearly continuous mantles of peat. Van Ryswyk's data (personal communication, 1987; Table 6; *also see* Figure 3) show the extent of peatland cover in part of the northeastern region.

TABLE 6
PER CENT ORGANICS IN EACH 1:50 000 NTS MAP AREA,
FORT NELSON REGION
 (A. van Ryswyk, personal communication, 1987)

NTS Map	% Organics	NTS Map	% Organics	NTS Map	% Organics
94J/9	78.1	94J/16	67.7	94O/5	24.2
94J/10	43.3	94O/1	29.8	94O/6	28.4
94J/13	11.2	94O/2	35.2	94O/7	36.1
94J/14	30.2	94O/3	25.8	94O/8	54.1
94J/15	32.8	94O/4	2.1		



POTENTIAL USES OF PEATLANDS

INTRODUCTION

Potential uses of peatland depend on properties of the peat, the climatic conditions in the area where the peatland is located and economic factors (for example, available markets and transportation costs) (Tarnocai, 1984). Peat deposits can be mined, either for energy or non-energy uses, or they may be used in situ (for example, for agriculture). Classification of peatlands enables a preliminary assessment of potential uses to be made. Peat deposits cannot be mined if they are not thick enough. Shallow organics are probably best suited for agriculture, forestry and wildlife uses. Where local hydrologic conditions preclude draining peatlands, they may be best retained in their natural state.

Fens, comprised mainly of moderately to well-decomposed, sedge-dominated peat, are relatively well aerated and contain a fair quantity of nutrients. Thick deposits may be suitable for energy peat production. If a fen is shallow, agriculture, and possibly forestry, are potential uses.

Thick sphagnum bogs are best suited for the production of non-energy peats. Their acidic, fibric nature makes them generally unsuitable for agriculture in their natural state. In larger and deeper bogs, there is usually considerable moderately to well-decomposed, sedge-dominated peat around the outer margins and beneath the central, surficial moss cover. After removal of the sphagnum surface, the underlying sedge peats may be suitable for energy peat production or for in situ agricultural use.

MINING OF PEATLANDS

Mining of peat, almost exclusively for horticultural use, occurred in the Fraser delta for over 40 years, ending in the mid-1980s. Burns Bog was the main source. The decline of British Columbia's peat industry is reflected in the following figures: in 1982, 20000 tonnes of peat were produced, but preliminary estimates for 1986 show only 3000 tonnes were harvested (Energy, Mines and Resources Canada, 1987). In terms of tonnage for 1986, British Columbia produced only 0.5 per cent of the Canadian total. Main producers were Quebec - 39.5 per cent, New Brunswick - 32.5 per cent, Manitoba - 12.5 per cent and Alberta - 10.0 per cent (*ibid.*). About 90 per cent of the peat produced in Canada is exported. Currently, there is no commercial peat harvesting being carried out in British Columbia. Horticultural moss peat is imported into the province, mainly from Alberta with small amounts from Manitoba and Saskatchewan.

Mining can be carried out by either dry or wet methods. Extensive site preparation, such as draining and grading, must be done before the dry methods (milled and sod mining techniques) can be used. Climate greatly affects this method because field drying is required to produce peat containing 35 to 50 per cent moisture. Wet mining requires much less site preparation because there is little movement of equipment on the peatland surface. A peat slurry with a very high water content (80 to 98 per cent) is produced and must be dried in a dewatering plant. Wet mining was used in the later years at Burns Bog (Biggs, 1976) and is a useful method in wet climates or on peatlands which are difficult to drain.

The feasibility of mining peat is highly dependent on such climatic factors as precipitation, temperature, amount of sunshine, wind and length of the frost-free period (Table 7). Amount and distribution of rainfall are important especially for dry mining methods where long dry periods are needed to operate. Temperature and amount of sunshine have direct implications for field drying of milled peat. Steady, moderate winds are most favourable for evaporation. The duration of the frost-free period is an indication of the length of the peat production period, provided other climatic parameters are favourable. Perennially frozen peatlands are difficult to work using existing mining techniques.

TABLE 7
MINIMUM CLIMATIC REQUIREMENTS FOR USE OF AN AREA
FOR PEAT PRODUCTION
 (after Montreal Engineering, 1978)

Climatic Factor	Annual Requirement
Frost-free period	16 weeks, minimum
Bright sunshine	1000 hours, minimum
Days of rain	60, maximum
Wind	steady and moderate

The development of peat deposits for mining can be to produce either non-energy-use or energy-use peat. Characteristics of peat important for these two uses are described as follows:

Non-energy Peat - Slightly humified, sphagnum peat (H1 to H4), because of its internal structure, has high water-holding capacity, high cation-exchange capacity, high pore space, relatively high permeability, compressibility and capability of resuming the original structure even after compression to a tenth of its original volume (Monenco Ontario Ltd., 1981).

Sphagnum peat is an important horticultural product; when added to a soil it increases the organic content and the ability to retain water and nutrients, and improves aeration (Tarnocai, 1984). It is used mainly in greenhouses, gardens, landscaping and the manufacture of peat pots, pellets and growing plates. As long as liming, fertilizing and watering can be done in a controlled environment (for example, a greenhouse), sphagnum peat is an excellent horticultural product.

Sphagnum peat can also be used as an effective filtration and absorption agent because of its high surface area, porosity and exchange capacity. It has been used to remove suspended solids from effluents, chemically remove heavy metals, pigments and toxic materials from industrial effluents, and to absorb oil spills (Tarnocai, 1984).

Slightly humified sphagnum peat, in a relatively dry form, can be transported economically over long distances because it is light, compressible and resumes its original structure after compression.

Energy Peat - Fuel or energy peat requires a high degree of humification, high bulk density, relatively low ash content, low content of potential pollutants such as sulphur, and high calorific value. Sphagnum peat with a degree of humification of H4 or greater and sedge peat, H3 or greater, have the necessary characteristics, although dense well-decomposed peat of at least H5 is technically and economically superior.

The United States Department of Energy defines fuel grade peat as follows (Olson and Johnson, 1983):

- (1) has an energy value of at least 8000 Btu per pound [4440 kilocalories/kilogram] in an oven-dry state,
- (2) contains less than 25 per cent ash,
- (3) occurs in deposits that are at least 1.5 metres deep,
- (4) covers an area of 80 contiguous acres per square mile [12.5 hectares per square kilometre].

Peat mined for fuel can be fired in furnaces for heating or in boilers to generate steam which drives electricity-producing turbines. Mined fuel peat can also be processed into a variety of products including coke, synthetic natural gas and methanol (Tarnocai, 1984). Peat is easier to convert to natural gases and liquids than is coal which has a higher fixed-carbon content. Coal - based coke is

chemically inferior to coke produced from peat. Table 8 gives the basic energy values of fuel peat and other fuels and compares basic properties of these fuels (data are mainly from European sources).

IN SITU USES OF PEATLAND

Agriculture and forestry are two potential in situ uses of shallow, well-humified, sedge-dominated peatlands. These form good organic soils with high nutrient values and relatively high cation-exchange values. Conversely, the low nutrient content, high permeability and high acidity of slightly humified, sphagnum peat make it less suitable for in-place agriculture because greater expertise and higher development costs are required. Certain acid-tolerant crops such as blueberries and cranberries can be successfully grown on sphagnum bogs, but for most field crops intensive liming and fertilizing are usually needed.

Use of peatlands for forestry is uncommon in Canada but widespread in Europe. Tarnocai (1984) suggests that the best potential peat deposits for forestry enhancement are probably slope fens because they are usually sheltered, nutrient rich and easy to drain. The forest land base in British Columbia is so large that it is doubtful that any extensive silvicultural effort will be applied to peatlands in the foreseeable future.

In central and southern British Columbia, organic soils are important to commercial agriculture. Peatlands in the lower Fraser valley and on Vancouver Island have been intensely cultivated. Fen meadows in the Interior Plateau are less intensely used but they still represent an important source of forage for the ranching industry. The type of cropping and management practiced on organic soils of southwestern British Columbia is more conducive to degradation and decomposition of peat than that used in the cooler meadow fens in the central Interior. Grass production is the most benign and natural crop for organic soils (Levesque et al., 1987).

Examples and discussion of agricultural use and management of organic soils are available for Vancouver Island peatlands (Maas, 1972) and for Interior Plateau peatlands (van Ryswyk and Bawtree, 1972; Central Interior Forage Extension Committee, 1981).

Peatlands in their natural state play an important role in water management, affecting both water quantity and quality, and in providing important wildlife habitat. They help to maintain groundwater levels and surface water storages and serve as effective water purifiers and erosion and flood control mechanisms. Although peat deposits are not highly productive habitat for wildlife, they do provide important habitat diversity in many areas (for example, Interior Plateau). There is increasing evidence that the draining of interior fens for agricultural production has been accompanied by the alienation of wildlife from peatland margins which often are high quality habitat areas (Wildlife Habitat Canada, 1986). In northern British Columbia, peatlands are important areas for waterfowl breeding (L. Jones, Nature Trust of British Columbia, personal communication, 1988).

Another potential use of peat deposits is for recreation. This is the least disruptive use of wetland areas as it takes advantage of the abundant resources offered by wetland ecosystems, yet is relatively non-destructive. Activities such as hunting, bird watching, hiking and nature photography are popular, particularly where peatlands occur near centres of population (for example, lower Fraser valley).

ENVIRONMENTAL CONSIDERATIONS

Two obvious environmental considerations regarding the development of peat deposits for commercial use pertain to draining the peatland and the change of habitat. Drainage by surface ditching is necessary to lower the water content of the upper layer of peat sufficiently to make the surface firm enough to carry production equipment (be it for mining or farming). The effects of drainage are usually minor but may locally affect runoff, groundwater conditions, water quality and organic silting. In evaluating the potential environmental impact of draining a peatland a number of items should be considered: local hydrogeology and groundwater, drainage rates from the peat, the radius of influence of the lowered water table and quality of the drained water (Monenco Ontario Ltd., 1981).

TABLE 8
COMPARISON OF THE PROPERTIES OF VARIOUS FUELS
(Monenco Ontario Ltd., 1981)

Properties of Fuels	Heavy Fuel Oil	Coal (Bituminous)	Coal (Lignite)	Peat	Wood
C %	83-86	76-87	67-75	50-60	48-50
H %	11.5-12.5	3.5-5.0	4.5-5.5	5.0-6.5	6.0-6.5
O %	1.5-2.5	2.8-11.3	20-30	30-40	38-42
N %	0.2-0.3	0.8-1.2	1-2	1.0-2.5	0.5-2.3
S %	2.0-2.8	1-3	1-3	0.1-0.2	-
Ash content, %	0.3	4-10	6-10	2-10	0.4-0.6
Melting point of ash, C ^o	-	1100-1300	1100-1300	1100-1200	1350-1450
Volatiles, %	-	10-50	50-60	60-70	75-85
Bulk density, kg/m ³	920-970	720-880	650-780	300-400	320-420
Effective heat value of dry matter, kcal/kg	9900-10 000	6800-7900	4800-5800	4700-5100	4400-4600
Operational moisture, %	0.1	3-8	40-60	40-60	30-55
Effective heat value at the lowest operational moisture content, kcal/kg	-	6570-7640	2640-3240	2500-3000	2900-3040
Effective heat value at the highest operational moisture content, kcal/kg	-	6200-7220	1560-1960	1780-1960	1650-1740

Peat mining destroys the natural habitat of a peatland by stripping the surface vegetation, draining the site and removing the peat. Developers should be required to carry out environmental impact and socio-economic studies to justify the worth of a peat harvesting operation in comparison to the values of retaining the peatland in its natural state (for wildlife habitat, recreational opportunities, aesthetic value).

Peat harvesting areas may be successfully reclaimed provided a proper plan is in place. Consideration must be given to a number of factors including type of mining method, depth and type of peat and surface topography left, and potential land use after mining. Large drained level areas, usually left after dry-method harvesting, may prove suitable for agricultural or forestry production. Peatlands mined by hydraulic methods are usually left with open, shallow lakes which could be developed for waterfowl habitat.

Environmental problems can also be caused by agricultural use of peatlands where heavy supplements of lime and fertilizer are required. Leaching of these chemical additives may contaminate the groundwater and the surface runoff.

PEAT RESOURCES OF BRITISH COLUMBIA

INTRODUCTION

Three regions of the province are identified by the peatland inventory as being the main sources of peatland resource. The most extensive deposits occur in the northeast although their full extent is unknown because of the incomplete mapping in this area. Huge peat deposits also occur on certain coastal lowlands. Interior peatlands are usually smaller, but occur in clusters over large areas of the rolling plateau. Areas of the province for which there is no base-data information (see Figure 4) are not likely to contain many areas of significant peat deposits (other than the northeast) because they mainly include mountainous regions (Coast Mountains, North Central Ranges, Rocky Mountains).

Quantitative information is not available for the peat resource of the central Interior or the northeast. Dendron Resource Surveys Ltd. (1985) discussed the peat resource of coastal British Columbia in some detail based on the reconnaissance mapping of Tarnocai (in preparation).

COASTAL PEAT RESOURCE

Total volume of peat in the Pacific coast study area mapped by Tarnocai is estimated to be 3854 million cubic metres of which 2990 million cubic metres occur in flat and slope bogs. These bogs have a relatively thin surficial cover of sphagnum peat overlying moderately deep, well-humified sedge, amorphous and sedimentary peats. The horticultural quality of this bog peat is limited because of high humification values and high sedge components but it has potential as a source of fuel peat. Peat found in bogs of the Pacific coast study area has an average energy value of 5.4 million kilocalories per tonne (23 million kilojoules per tonne). These energy values are higher than the national average peat energy value of 4.8 million kilocalories per tonne (20 million kilojoules per tonne) (Dendron Resource Surveys Ltd., 1985). Most of the sphagnum and sedge-dominated peat types meet the criteria (such as degree of humification, bulk density, calorific values, ash content) for acceptable fuel-grade peat.

There are many limitations to developing a potential peat resource on the north coast. Peat mining would be most cost efficient on deep, large deposits such as those on Banks Island, Graham Island, and in the Nootka Sound and Prince Rupert areas. Deposits should be at least 2 metres deep to prevent mineral soil contamination during the draining and extraction of peat. Most of these large peatlands are far removed from major population centres and are inaccessible by land. Large flat and slope bogs may be difficult to drain because of their size and perennial high water tables. High rainfall probably precludes use of dry mining methods; hydraulic mining with mechanical dewatering, such as employed at Burns Bog, may be the only practical method of peat mining in the coastal climate. Many of the peatlands contain basal sedimentary peat which would probably not support heavy machinery.

The peat resource of the Fraser valley and eastern Vancouver Island has largely been pre-empted for a variety of uses, including agriculture, or has been depleted. As populations increase and rural development expands, more organic deposits are likely to become easily accessible. Most of them may prove to be suitable for a variety of agricultural uses because of favourable climate and peat characteristics. However, some of them may also be required in their natural state to provide important wildlife habitat. There are no sphagnum peatlands in this area which have not already been exploited or otherwise pre-empted and which are large enough and deep enough to support a horticultural peat industry. Burns Bog, forming as it did on an aggrading delta, appears to be unique to the peatlands of British Columbia (C. Selby, personal communication, 1988).

INTERIOR PLATEAU PEAT RESOURCE

The peatlands of the central Interior are concentrated in a triangular region with corners at Smithers, 100-Mile House and a point northeast of Prince George. These organic deposits are fairly accessible to main provincial highways and railways. Most of the peatlands are classified as fens or undifferentiated organics which range from poorly to well decomposed. These are usually sedge-dominated peats, although brown moss peat is also common in the Cariboo - Chilcotin area. There are few sphagnum bogs in the area; some large fens may have a thin sphagnum moss cover in their central portion and be classed as fen-bog complexes.

Many of the meadow fens have been developed for agriculture, providing an important source of natural and cultivated hay and pasture for the ranching industry. Wildlife use of these peatlands is extensive and conflicts between wildlife and agricultural use are becoming more common.

The probability of locating good horticultural peat sources in this region is low. East and northeast of Prince George some sphagnum bogs have been identified but are not well described. More detailed information from this area is required before a horticultural peat resource can be accurately assessed. Characteristics of the fen peatlands suggest that a viable fuel-peat resource may exist. Although there are few large individual peat deposits, there are extensive areas, particularly west of the Fraser River, containing many contiguous peatlands within favourable terrain. Major physical limitations to developing these deposits are the size and depth of the many interconnected deposits.

Most of this region has no climatic limitations to peat mining. Accessibility to major transportation corridors is generally good but the region as a whole is fairly removed from major markets. However, there are numerous smaller centres which may be considered as potential local markets.

NORTHEAST PEAT RESOURCE

The peat resource of the northeast is the largest in the province but is subject to many limitations on its development. Most of the peatlands are classified as sphagnum bogs and have potential for both horticultural peat (surficial sphagnum) and fuel peat (underlying organic material which is denser and more humified). Despite the extensive size of the deposits, use of the area as a source of mined peat, other than on a local scale, is severely constrained. Major industrial markets are far removed even though main provincial highways and railways exist in the area. However, the severest restrictions to peat mining are imposed by climate which would limit the number of productive days each year.

Data for the Fort Nelson area suggest that the extensive peatlands of the northeast contain large areas of permafrost. Environmental considerations and existing peat mining technology currently restrict any mining development north of the southern limit of discontinuous permafrost (Figure 1).

In situ agricultural use of peatland fens in the Fort St. John - Dawson Creek area is practical, subject to the climatic constraints controlling agriculture in this area. As in the central Interior, peat deposits can be developed as a source of native hay and pasture for the ranching industry. Cultivated hay and cereal crops are also grown on some organic soils in this region.

CONCLUSIONS AND RECOMMENDATIONS

This peatland inventory is not designed to provide data for site-specific evaluation; rather, it identifies the occurrence of peatlands, providing a starting point for assessing development potential. At the level of detail undertaken in this survey, users can confidently identify and make preliminary evaluations of peatlands that have development potential because of their accessibility and proximity to potential markets. The following conclusions summarize the main findings of this study:

- * Large coastal peat deposits consist mainly of flat and slope bogs located on the Queen Charlotte Lowland, in the Nootka Sound area and near Prince Rupert.
- * These coastal bogs usually have a thin surficial cover of sphagnum moss over well-humified sedge-dominated peat.
- * Good horticultural sphagnum peat occurs in some slope and domed bogs; however, in most bogs horticultural quality is limited because of high sedge content.
- * Limitations to developing a fuel or horticultural peat industry on the north coast include climate (particularly rainfall), inaccessibility and poor drainage.
- * Accessible peat deposits of the lower Fraser valley and eastern Vancouver Island, including the sphagnum bogs of the Fraser delta, have largely been pre-empted or depleted.
- * Large fens and contiguous peatlands in the central Interior could provide potentially good sources of fuel peat because climate, access and transportation facilities are generally favourable.
- * Good sources of horticultural peat in the central Interior are limited and more detailed work is required to adequately predict any development possibilities.
- * Peat bogs in northeastern British Columbia are very extensive and contain peat acceptable for both horticultural and fuel uses but their suitability for mined peat is severely limited by climate and remoteness.
- * Permafrost in the Fort Nelson area is a major limiting factor to peat extraction.
- * Agricultural use of peatlands is common in the Fraser valley, eastern Vancouver Island, central Interior and Peace River area.

Follow-up work to this peatland inventory should concentrate on generating data which provide more specific information about the peat resource in the three main peat areas of the province. Recommendations are as follows:

- * For unmapped areas, any new inventory would best be done only for areas where significant peatlands probably occur and where climate and access are favourable (for example, parts of the northeast, such as 94G and 94H/N 1/2, and the Chilcotin, 94C).
- * Further detailed study should be carried out on a site-specific basis on large coastal peatlands which are easily accessible, to determine their resource potential for horticultural and fuel peat; bogs in the Prince Rupert area and some undifferentiated peatlands on Vancouver Island are appropriate sites for detailed ground study.

- * More detailed study in the central Interior and northeast should concentrate in areas where the peatland inventory maps identify potential deposits of favourable peat type and characteristics, and which are accessible to potential markets; potential suitability for in situ uses should also be considered in selecting such areas.
- * Level 2 survey work (Table 2) in the central Interior and northeast should involve interpretation of large-scale (1:20 000 to 1:30 000) aerial photographs combined with selective field checking to provide data to help infer ranges of peat thickness and general characteristics and distribution of peat type, which can then be used to calculate preliminary figures on the overall peat resource.
- * Peat deposits identified and evaluated by a Level 2 survey should be ranked according to their most suitable end-use; ranking could consider factors such as environmental sensitivity, wildlife use, habitat and conservation, agriculture, forestry, recreation, potential for peat mining and regional climate.
- * Levels 3 and 4 surveys (Table 2), involving detailed ground studies and site-specific assessments, are probably best left to individual developers and academic researchers.
- * Suggested research into forestry uses for coastal peat deposits by Dendron Resource Surveys Ltd. (1985) includes use of organic material as a soil conditioner for tree regeneration and as a soil enhancer for erosion control on logged slopes.

ACKNOWLEDGMENTS

Funding for this program was provided by the Canada/British Columbia Mineral Development Agreement (MDA). Z.D. Hora was instrumental in initiating the program and provided many useful suggestions during the study.

Corinne Selby, Agriculture Canada Research Station, Vancouver, deserves special thanks for her helpful suggestions and informative comments. Herb Luttmerding, British Columbia Ministry of Environment and Parks, Victoria, also contributed valuable discussion. Thanks also to these two for critically reading this report.

The author is very grateful to two members of Agriculture Canada who supplied valuable unpublished data which greatly added to this study. Charles Tarnocai, Ottawa, lent manuscript maps of his preliminary mapping of coastal peatlands. Al van Ryswyk, Kamloops, provided voluminous data on areal extent of wetlands and organics in the province.

A number of people helped in the compiling of data sources. Karen Gorse of MAPS-BC coordinated the ordering of most of the base-data maps and reports. Terje Vold, Bruce Thomson, Bob Maxwell and Mike Fenger, British Columbia Ministry of Environment and Parks, Victoria, were also helpful in finding little-known or misplaced data.

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BY SAMUEL JOHNSON

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APPENDIX 1 - GLOSSARY

- Bulk density** - The total weight (including solid material and any contained water) of a material per unit volume (including voids).
- Energy peats** - Peats with low ash content, high bulk density and high degree of humification.
- Eutrophic** - Designation for soils with high nutrient content and high biological activity. Fens are an example of eutrophic peat.
- Fibric** - The least decomposed of all organic soil materials. It has large amounts of well-preserved fibre that is readily identifiable as to botanical origin.
- Gleysolic soils** - Mineral soils that are saturated with water for long periods of the year and their profiles show evidence of reducing conditions. Transformations of the mineral fraction by chemical oxidation and the decomposition of the organic fraction by aerobic micro-organisms are severely curtailed by the lack of oxygen. They occur wherever water is added to the soil faster than it drains away.
- Horticultural** - Peat used as a soil enhancer or soil enricher. Sphagnum moss is the most suitable peat because it is slightly humified and has fibric structure with high water-holding capacity, high pore space, relatively high permeability, high cation-exchange capacity and compressibility.
- Humic** - The most highly decomposed of the organic soil materials. It has the least amount of plant fibre, highest bulk density and lowest saturated water content. It is very stable and changes little physically and chemically over time in comparison to other organic materials.
- Humification** - The extent of decomposition. Degree of humification can be determined by the modified von Post system (see Appendix 3).
- Marl** - Loose earthy deposit of calcium or magnesium carbonate.
- Mesic** - Intermediate stage of decomposition between fibric and humic. Material has an intermediate amount of fibre, bulk density and water content.
- Mesotrophic** - Of medium nutrient content; intermediate between eutrophic and oligotrophic.
- Minerotrophic** - Nourished by mineral water; refers to peatlands which receive nutrients from groundwater percolating from mineral substrate.
- Oligotrophic** - Sites with low nutrient availability and relatively low biological activity. Raised bogs are examples; trees are stunted and shrub layer is poorly developed. Organic material is poorly decomposed. Sphagnum peat is characteristic.
- Ombrotrophic** - Refers to peatlands dependent on receiving moisture from rain. Nutrient-poor and acidic water mainly occurs in bogs.
- Peatland** - Land covered by peat and characterized by a high water table.

Permafrost - Perennially frozen ground whose mean temperature remains below 0°C continually for one or more years. The southern limit of permafrost follows approximately the - 1 C average annual isotherm.

Rubbed fibre - A relative measure for expressing the amount of fibric content organic material that exists in a peat sample.

von Post system - Originally a system for determining the degree of humification. Later expanded (modified system) to include other characteristics such as peat type, moisture content and fibrosity (see Appendix 3).

APPENDIX 2

COMMON PEAT LANDFORMS OF BRITISH COLUMBIA (after Tarnocai, 1984 and the National Wetlands Working Group, 1987)

- Bog Wetland Forms -** These differ from one another in surface form, relief and proximity to bodies of water.
- Basin bog -** A bog situated in a basin that has an essentially closed drainage system, receiving water from precipitation and from runoff from the immediate surroundings. The surface of the bog is flat, but the peat is generally deepest at the centre.
- Blanket bog -** A bog consisting of extensive peat deposits that occur more or less uniformly over gently sloping hills and valleys. The peat thickness seldom exceeds 2 metres.
- Collapse-scar bog -** A circular or oval-shaped wet depression in a perennially frozen peatland. The collapse-scar bog was once part of the perennially frozen peatland, but the permafrost thawed, causing the surface to subside. The depression is poor in nutrients, as it is not connected to the minerotrophic fens in which the palsa or peat plateau occurs.
- Domed bog -** A large (usually more than 500 metres in diameter) bog with a convex surface, rising several metres above the surrounding terrain. The centre is usually draining in all directions. Small crescentic pools often form around the highest point. If the highest point is in the centre, the pools form a concentric pattern, or eccentric if the pattern is off-centre. Peat development is usually in excess of 3 metres.
- Flat bog -** A bog having a flat, featureless surface. It occurs in broad, poorly defined depressions. The depth of peat is generally uniform.
- Northern plateau bog -** A raised bog elevated 0.5 to 1 metre above the surrounding fen. The surface is generally even, characterized only by small wet depressions. The plateau bog is usually teardrop-shaped, with the pointed end oriented in the downslope direction.
- Palsa bog -** A bog composed of individual or coalesced palsas, occurring in an unfrozen peatland. Palsas are mounds of perennially frozen peat and mineral soil, up to 5 metres high, with a maximum diameter of 100 metres. The surface is highly uneven, often containing collapse-scar bogs.
- Peat plateau bog -** A bog composed of perennially frozen peat, rising abruptly about 1 metre from the surrounding unfrozen fen. The surface is relatively flat and even, and often covers very large areas. The peat was originally deposited in a non-permafrost environment and is often associated with collapse-scar bogs or fens.
- Slope bog -** A bog occurring in areas of high rainfall on appreciably sloping land surfaces, fed by rainwater and by water draining from other nutrient-poor peatlands. The peat may exceed 1 metre in thickness.

- String bog -** A pattern of narrow (2 to 3 metres wide), low (less than 1 metre deep) ridges oriented perpendicular to the direction of drainage. Wet depressions or pools occur between the ridges. The water and peat are very low in nutrients, as the water has been derived from other ombrotrophic wetlands. Peat thickness exceeds 1 metre.
- Veneer bog -** A bog occurring on gently sloping terrain underlain by generally discontinuous permafrost. Although drainage is predominantly below the surface, overland flow occurs in poorly defined drainage-ways during peak runoff. Peat thickness is usually less than 1.5 metres.
- Fen Wetland Forms -** These differ from one another in surface form, relief, proximity to bodies of water and basin topography.
- Collapse-scar fen -** A fen with circular or oval depressions, up to 100 metres in diameter, occurring in larger fens, marking the subsidence of thawed permafrost peatlands. Dead trees, remnants of the subsided vegetation of permafrost peatlands, are often evident.
- Floating fen -** A fen occurring adjacent to ponds or lakes, forming a floating mat, underlain by water or fluid, loose peat. The fen surface is less than 0.5 metre above the level of the lake and the rooting zone is affected by lake water.
- Horizontal fen -** A fen with a very gently sloping, featureless surface. This fen occupies broad, often ill-defined depressions, and may be connected with other fens. Peat accumulation is generally uniform.
- Net fen -** A fen with a broad net pattern of low, interconnected peat ridges ("strings"), enclosing wet hollows or shallow pools. The wetland surface is almost completely level; greater slopes result in the formation of northern ribbed fens.
- Northern ribbed fen -** A fen with parallel, low peat ridges ("strings") alternating with wet hollows or shallow pools, oriented across the major slope, perpendicular to water movement. The depth of peat exceeds 1 metre.
- Shore fen -** A fen with an anchored surface mat that forms the shore of a pond or lake. The rooting zone is affected by the water of the lake at both normal and flood levels.
- Stream fen -** A fen located in the main channel or along the banks of permanent or semi-permanent streams. This fen is affected by the water of the stream at normal and flood stages.

APPENDIX 3

MODIFIED VON POST SYSTEM (from Monenco Ontario Ltd., 1981)

VON POST DEGREE OF HUMIFICATION

**Degree of
Humification
von Post's
Scale**

Description

- H1 - Completely undecomposed peat which, when squeezed, releases almost clear water. Plant remains easily identifiable. No amorphous material present.
- H2 - Almost completely undecomposed peat which, when squeezed, releases clear or yellowish water. Plant remains still easily identifiable. No amorphous material present.
- H3 - Very slightly decomposed peat which, when squeezed, releases muddy brown water, but for which no peat passes between the fingers. Plant remains still identifiable, and no amorphous material present.
- H4 - Slightly decomposed peat which, when squeezed, releases very muddy dark water. No peat is passed between the fingers but the plant remains are slightly pasty and have lost some of their identifiable features.
- H5 - Moderately decomposed peat which, when squeezed, releases very muddy water with also a very small amount of amorphous granular peat escaping between the fingers. The structure of plant remains is quite indistinct, although it is still possible to recognize certain features. The residue is strongly pasty.
- H6M - Moderately to strongly decomposed peat with a very indistinct plant structure. When squeezed, about one-third of the peat escapes between the fingers. The residue is strongly pasty but shows the plant structure more distinctly than before squeezing.
- H7 - Strongly decomposed peat. Contains a lot of amorphous material with very faintly recognizable plant structure. When squeezed, about one-half of the peat escapes between the fingers. The water, if any is released, is very dark and almost pasty.
- H8 - Very strongly decomposed peat with a large quantity of amorphous material and very dry indistinct plant structure. When squeezed, about two thirds of the peat escapes between the fingers. A small quantity of pasty water may be released. The plant material remaining in the hand consists of residues such as roots and fibres that resist decomposition.
- H9 - Almost fully decomposed peat in which there is hardly any recognizable plant structure. When squeezed, almost all of the peat escapes between the fingers as a fairly uniform paste.
- H10 - Completely decomposed peat with no discernible plant structure. When squeezed, all the wet peat escapes between the fingers.

VON POST MOISTURE REGIME, FIBRE CONTENT AND DEGREE OF WOODINESS

Moisture Regime 'B' (Scale 1 to 5)

B1 Dry peat
B2 Low moisture content
B3 Moderate moisture content
B4 High moisture content
B5 Very high moisture content

Fine Fibre Content 'F' (Scale 0 to 3)

F0 Nil
F1 Low content
F2 Moderate content
F3 High content

Coarse Fibre Content 'R' (Scale 0 to 3)

R0 Nil
R1 Low content
R2 Moderate content
R3 High content

Woodiness 'W' (Scale 0 to 3)

W0 Nil
W1 Low content
W2 Moderate content
W3 High content

APPENDIX 4 **LIST OF DATA SOURCES USED TO COMPILE** **THE PEATLAND INVENTORY**

The following list of data sources is compiled by NTS map area, map theme and map scale. Most of these sources are available from MAPS-BC, British Columbia Ministry of Environment, Victoria. These include soil and soil and landform maps and reports, both federal and provincial, soil capability and agricultural capability maps, terrain maps and soil landscape maps. They can be ordered by supplying the map or report theme (for example, soil), NTS area and scale. Geological Survey of Canada surficial geology maps must be obtained from the Geological Survey of Canada, Vancouver. Maps of Peatlands of the Pacific Coast are not yet published; manuscript copies are with C. Tarnocai, Agriculture Canada, Ottawa.

The list is presented as a complete summary of all data sources which contain information about distribution of peat deposits in British Columbia. Forest cover and forest inventory maps, which exist for almost all areas of the province at 1:50 000-scale, are not included in this list because they are difficult to interpret and provide inconclusive data about organic wetlands. These maps are based on the commercial viability of various tree species, so untreed areas such as wetlands receive little attention.

A bracketed number refers to a data source which includes a published report and which is listed in the selected bibliography.

Map Sheet	Sources Used for Map Compilation	Other Information Sources (more detail or larger scale)	Source Information Scale	NTS
82E	Soil Capability for Agriculture		1:125 000	all
		Soil Maps	1:50 000	all
		Detailed Soils - Okanagan-	1:20 000	part of W 1/2
82F	Soil Resources of the Nelson Map Area (10) Soil Capability for Agriculture		1:100 000	all
			1:125 000	all
		Soil and Landform Maps	1:50 000	all
82G	Soil Capability for Agriculture Generalized Terrain: Elk-Flathead Strategic Planning Unit Biophysical Resources of the East Kootenay Area: Generalized Terrain (20)		1:125 000	all
			1:125 000	all
			1:250 000	all
		Soil Maps	1:50 000	1-8, 10-15
		Terrain Maps	1:50 000	1-8, 10-15
82J	Soil Capability for Agriculture Generalized Terrain: Elk-Flathead Strategic Planning Unit		1:125 000	W 1/2
			1:125 000	W 1/2

Map Sheet	Sources Used for Map Compilation	Other Information Sources (more detail or larger scale)	Source Information Scale	NTS
	Biophysical Resources of the East Kootenay Area: Generalized Terrain (20)		1:250 000	W 1/2
	Ecological Land Classification of Kootenay National Park (1)		1:50 000	12W, 13W
		Soil Maps	1:50 000	2-7, 10-14
		Terrain	1:50 000	2-7, 10-14
82K	Soil Resources of the Lardeau Map Area (27)		1:100 000	all
	Soil Capability for Agriculture		1:125 000	all
	Ecological Land Classification of Kootenay National Park (1)		1:50 000	16E
		Soil and Landform Maps	1:50 000	all
82L	Soil Capability for Agriculture		1:125 000	all
	Geology M1391A, M1392A (7)	G.S.C. Surficial	1:126 720	W 1/2
		Soil Maps	1:50 000	all
82M	Soils of the Seymour Arm Area (13)		1:100 000	all
	Soil Capability for Agriculture		1:125 000	all
		Soil Maps	1:50 000	all
		Terrain Maps	1:50 000	all
82N	Soil Capability for Agriculture		1:125 000	SE
	Soil Survey of Upper Columbia River Valley		1:63 360	2, 6, 7, 11
	Ecological Land Classification of Mt. Revelstoke, Glacier and Kootenay National Parks (1)		1:50 000	1, 3-6, 8
	Biophysical Inventory of Yoho National Park (4)		1:50 000	1, 2, 7-10

Map Sheet	Sources Used For Map Compilation	Other Information Sources (more detail or larger scale)	Source Information Scale	NTS
82O	Soil Capability for Agriculture		1:125 000	4
	Generalized Terrain: Elk-Flathead Strategic Planning Unit		1:125 000	4
	Biophysical Resources of the East Kootenay Area: Generalized Terrain (20)		1:250 000	4
	Ecological Land Classification of Kootenay National Park (1)		1:50 000	4
		Soil Map	1:50 000	4
		Terrain Map	1:50 000	4
83C	Insufficient data for compilation			
83D	Soils of the Upper Part of Fraser River Valley		1:126 720	11,14
	Wells Gray Biophysical Folio: Surficial Materials		1:100 000	4, 5, 12
83E	Soils of the Upper Part of Fraser River Valley		1:126 720	4
92B	Peatlands of the Pacific Coast - Preliminary Mapping by C. Tarnocai (22)		1:250 000	W 1/2
	Soils of Southern Vancouver Island (11)		1:100 000	W 1/2
		Soil Maps	1:50 000	5, 6, 11-14
		Terrain Maps	1:50 000	5, 12, 13
		Detailed Soils - Southeast Vancouver Island	1:20 000	5, 6, 11-13
		Detailed Soils - Gulf Islands	1:20 000	13, 14
92C	Peatlands of the Pacific Coast - Preliminary Mapping by C. Tarnocai (22)		1:250 000	N 1/2
	Soils of Southern Vancouver Island (11)		1:100 000	N 1/2
		Soil Maps	1:50 000	8-11, 13-16
		Terrain Maps	1:50 000	8-11, 13-16

Map Sheet	Sources Used for Map Compilation	Other Information Sources (more detail or larger scale)	Source Information Scale	NTS
92E	Peatlands of the Pacific Coast - Preliminary Mapping by C. Tarnocai (22)		1:250 000	N 1/2, SE
		Soil Maps	1:50 000	7-10, 14-16
		Terrain Maps	1:50 000	7-10, 14-16
92F	Peatlands of the Pacific Coast - Preliminary Mapping by C. Tarnocai (22)		1:250 000	all
	Soils of Southern Vancouver Island (11)		1:100 000	all
	Soil Capability for Agriculture		1:125 000	E 1/2
		Soil Maps	1:50 000	all
		Terrain Maps	1:50 000	all
92G	Peatlands of the Pacific Coast - Preliminary Mapping by C. Tarnocai (22)		1:250 000	W 1/2
	Soils of Southern Vancouver Island (11)		1:100 000	4
	Soil Capability for Agriculture		1:125 000	16
	G.S.C. Surficial Geology M1484A		1:50 000	2, 7S
	G.S.C. Surficial Geology M1485A		1:50 000	1
	G.S.A. Surficial Geology M1486A		1:50 000	3E, 6SE
	Soils of the Langley-Vancouver Map Area - Vol. 1 (19)		1:25 000	1, 2, 3E
	Vol. 2		1:50 000	7, 8
		Terrain Maps	1:50 000	NW
		Detailed Soils - Southeast Vancouver Island and Gulf Islands	1:20 000	4
92H	Soils of the Tulameen Area (15)		1:126 720	NE
	Soils of the Princeton Area (8)		1:125 000	SE
	Soil Capability for Agriculture		1:125 000	E 1/2, SW
	G.S.C. Surficial Geology M1487A		1:50 000	4W

Map Sheet	Sources Used For Map Compilation	Other Information sources (more detail or larger scale)	Source Information Scale	NTS
92I	Soil and Landform Maps		1:100 000	all
	G.S.C. Surficial		1:126 720	SE
	Geology M1393A (7)			
	G.S.C. Surficial		1:126 720	NE
	Geology M1394A (7)			
	G.S.C. Surficial		1:126 720	SW
	Geology M1511A (21)			
92J	G.S.C. Surficial		1:126 720	NW
	Geology M1405A			
	Soil and Landform Maps		1:50 000	all
	Terrain Maps		1:50 000	4, 5, 12, 13
	Soil Capability for Agriculture		1:50 000	parts of 2, 3, 7, 9-11, 15, 16
	Soil Survey of Pemberton Valley		1:20 000	parts of 7, 9-11
92K	Peatlands of the Pacific Coast - Preliminary Mapping by C. Tarnocai (22)		1:125 000	all
	Soils of Southern Vancouver Island (11)		1:100 000	SW
	Soil Capability for Agriculture		1:125 000	S 1/2
	Soil Maps		1:50 000	3-6
	Terrain Maps		1:50 000	1-11, 14-16
92L	Peatlands of the Pacific Coast - Preliminary Mapping by C. Tarnocai (22)		1:250 000	all
	Soil Capability for Agriculture		1:125 000	SE
	Soil Maps		1:50 000	1-8, 10-13
	Terrain Maps		1:50 000	1-8, 10-13
92M	Peatlands of the Pacific Coast - Preliminary Mapping by C. Tarnocai (22)		1:250 000	W 1/2, SE
	Soils and Landforms of Sheelahant Drainage		1:50 000	part of NE
92N	Terrain Maps		1:50 000	1-3, 6

Map Sheet	Sources Used for Map Compilation	Other Information Sources (more detail or larger scale)	Source Information Scale	NTS
92O	Soils of Taseko Lakes Area		1:100 000	all
	Soil Capability for Agriculture		1:125 000	all
		Soil and Landform Maps	1:50 000	all
92P	Soils of Lac La Hache - Clinton Area (25)		1:125 000	W 1/2
	Soil and Landform Maps		1:125 000	E 1/2
	Soil Capability for Agriculture		1:125 000	all
		Soil Maps	1:50 000	W 1/2
		Terrain Maps	1:50 000	W 1/2
93A		Soil and Landform Maps	1:50 000	E 1/2
	Soils of the Horsefly Area (14)		1:100 000	W 1/2
	Soil Capability for Agriculture		1:125 000	S 1/2
	Wells Gray Biophysical Folio: Surficial Materials		1:100 000	1,8,9
		Soil and Landform Maps	1:50 000	W 1/2
93B	Soils of the Quesnel Area (18)		1:100 000	NE
	Soils for Nazko River - Telegraph Range Area		1:100 000	NW
	Soils for Williams Lake - Alexis Creek Area		1:100 000	S 1/2
	Soil Capability for Agriculture		1:125 000	all
		Soil and Landform Maps	1:50 000	all
93C	Terrain Inventory, Nechako Plateau (9)		1:100 000	part of 13
	Upper Dean River Resource Folio: Agriculture Capability and Forest Zonation		1:50 000	parts of 11-13
93D	Terrain Maps		1:50 000	parts of 7E, 8
		Agriculture Capability	1:50 000	parts of 7E, 8
		Kimsquit Study - Landforms-Slope-Soil-Vegetation	1:50 000	parts of 14, 15

Map Sheet	Sources Used for Map Compilation	Other Information Sources (more detail or larger scale)	Source Information Scale	NTS
93E	Soil and Landform Maps		1:125 000	15, 16
	Soil Capability for Agriculture		1:125 000	NE
	Terrain Inventory, Nechako Plateau (9)		1:100 000	8E
	Generalized Terrain: Skeena - Nass Strategic Planning Unit		1:250 000	NW
		Soil and Landform Maps	1:50 000	15, 16
		Terrain Maps	1:50 000	8E, 11-14
		Kimsquit Study - Landforms - Slope-Soil-Vegetation	1:50 000	parts of 2, 3, 6
93F	Soils of Nechako-Francois Lake Area (5)		1:125 000	N 1/2
	Terrain Inventory, Nechako Plateau (9)		1:100 000	SW
	Soil Capability for Agriculture		1:125 000	N 1/2
	Terrain Maps		1:50 000	SE
		Terrain Maps	1:50 000	SW
		Soil and Landform Maps	1:50 000	N 1/2
93G	Soil and Landform Maps		1:125 000	N 1/2
	Soil Capability for Agriculture		1:125 000	all
	Soils of the Quesnel Area (18)		1:100 000	SE
	Soils for Nazko River - Telegraph Range Area		1:100 000	SW
		Soil and Landform Maps	1:50 000	all
93H	Soils of the Barkerville Area (16)		1:100 000	W 1/2 (except 14)
	Soils of the Jarvis Creek - Morkill River Area		1:100 000	14, NE
	Soils of the Upper Part of Fraser River Valley		1:126 720	parts of 1, 7, 8
		Soil and Landform Maps	1:50 000	3-6, 11-13
		Soil Maps	1:50 000	9, 10, 14-16
		Terrain Maps	1:50 000	9, 10, 14-16

Map Sheet	Sources Used for Map Compilation	Other Information Sources (more detail or larger scale)	Source Information Scale	NTS
93I	Biophysical Soil Resources and Land Evaluation of North-east Coal Area (26)		1:250 000	N 1/2
	Soil Maps		1:50 000	N 1/2
	Soils of the Jarvis Creek - Morkill River Area		1:100 000	SE
	Soils of McGregor River Area		1:100 000	SW
		Soil and Landform Maps	1:50 000	3-6
		Soil Maps	1:50 000	1, 2, 7, 8
		Terrain Maps	1:50 000	1, 2, 7-16
93J	Soil and Landform Maps		1:100 000	S 1/2
	Soil Capability for Agriculture		1:125 000	S 1/2
	Biophysical Soil Resources and Land Evaluation for North-east Coal Area (26)		1:250 000	9
	Terrain Maps		1:50 000	9, 10, 15, 16
		Soil and Landform Maps	1:50 000	1-8
		Soil Map	1:50 000	9
93K	Soils of the Manson River - Fort Fraser Area (6)		1:100 000	N 1/2
	Soils of the Nechako - Francois Lake Area (5)		1:125 000	S 1/2
	Soil Capability for Agriculture		1:125 000	S 1/2
		Soil and Landform Maps	1:50 000	1-8
		Soil Maps	1:50 000	9-16
		Terrain Maps	1:50 000	9-16
93L	Soil Resources of Smithers - Hazelton Area		1:125 000	NE, NW, SE
	Soil Capability for Agriculture		1:125 000	NE, NW, SE
	Generalized Terrain: Skeena - Nass Strategic Planning Unit		1:250 000	SW
	G.S.C. Surficial Geology M1557A (3)		1:100 000	14
		Soil and Landform Maps	1:50 000	1, 2, 7-16
		Terrain Maps	1:50 000	3-6

Map Sheet	Sources Used for Map Compilation	Other Information Sources (more detail or larger scale)	Source Information Scale	NTS
93M	Soils of the Hazelton Area (28)		1:100 000	NE, NW, SE
	Soil Resources of Smithers - Hazelton Area		1:125 000	SW
	Soil Capability for Agriculture		1:125 000	SW
	G.S.C. Surficial Geology M1557A (3)		1:100 000	part of SW
		Soil and Landform Maps	1:50 000	3-6
		Soil Maps	1:50 000	1, 2, 7-16
		Terrain Maps	1:50 000	all
93N	Soils of the Manson River - Fort Fraser Area (6)		1:100 000	all
		Soil Maps	1:50 000	all
		Terrain Maps	1:50 000	all
93O	Soil and Landform Maps		1:100 000	NE
	Soil Capability for Agriculture		1:125 000	NE
	Terrain Maps		1:50 000	3-6, 11-14
	G.S.C. Surficial Geology M1383A		1:125 000	parts of 2, 3, 6, 11-13
	Generalized Terrain: Peace River Strategic Planning Unit		1:250 000	parts of 1, 8
		Soil Maps	1:50 000	9, 10, 15, 16
93P	Soils of the Fort St. John - Dawson Creek Area (17)		1:100 000	N 1/2
	Soil and Landform Maps		1:100 000	S 1/2
	Soil Capability for Agriculture		1:125 000	all
	G.S.C. Surficial Geology M1467A		1:250 000	all
		Soil Maps	1:50 000	1-8
		Soil and Landform Maps	1:50 000	9-16

Map Sheet	Sources Used for Map Compilation	Other Information Sources (more detail or larger scale)	Source Information Scale	NTS
94A	Soils of the Rose Prairie - Blueberry River Area		1:125 000	N 1/2
	Soils of the Fort St. John - Dawson Creek Area (17)		1:100 000	S 1/2
	Soil Capability for Agriculture		1:125 000	all
		Soil and Landform Maps	1:50 000	1-8
94B	Soil and Landform Maps		1:100 000	E 1/2
	Soil Capability for Agriculture		1:125 000	E 1/2
	Terrain Maps		1:50 000	3-5
	G.S.C. Surficial		1:125 000	parts of 1-4
	Geology M1382A			
		Soil Maps	1:50 000	1, 2, 7, 8
		Soil and Landform Maps	1:50 000	9, 10, 15, 16
94C	Terrain Maps		1:50 000	1, 2, 7-11, 14, 15
	G.S.C Surficial		1:125 000	parts of 1, 7, 8, 10, 14, 15
94D	Sturdee Road Project: Terrain		1:70 000	part of 15
94E	Sturdee Road Project: Terrain		1:70 000	parts of 2, 3
	Klappan Biophysical Project: Terrain Materials for Northwest Klappan Area		1:250 000	4, 5, 12
94F	Insufficient data for compilation			
94G	Insufficient data for compilation			
94H	Soils of the Nig Creek - Big Arrow Creek Area		1:125 000	S 1/2
	Soil Capability for Agriculture		1:125 000	S 1/2
		Soil Maps	1:50-000	1-8
94I	Insufficient data for compilation			

Map Sheet	Sources Used for Map Compilation	Other Information Sources (more detail or larger scale)	Source Information Scale	NTS
94J	Soils of the Fort Simpson Trail Area (12)		1:100 000	part of NW
	Soils of the Fort Nelson Area (24)		1:126 720	NE
	Soil Capability for Agriculture		1:125 000	NE
		Soil Maps	1:50 000	parts of 11-14
94K	Insufficient data for compilation			
94L	Insufficient data for compilation			
94M	Liard River Hydro-electric Development: Soils, Surficial Geology and Landform Inventory (23)		1:100 000	3-16
94N	Liard River Hydro-electric Development: Soils, Surficial Geology and Landform Inventory (23)		1:100 000	2-7, 9-12
94O	Soils of the Fort Simpson Trail Area (12)		1:100 000	S 1/2
		Soil Maps	1:50 000	1-8
94P	Insufficient data for compilation			
102I	Soil Maps		1:50 000	parts of 8, 9, 15, 16
	Terrain Maps		1:50 000	parts of 8, 9, 15, 16
102P	Peatlands of the Pacific Coast - Preliminary Mapping by C. Tarnocai (22)		1:250 000	9, 16
103A	Peatlands of the Pacific Coast - Preliminary Mapping by C. Tarnocai (22)		1:250 000	all

Map Sheet	sources Used for Map Compilation	Other Information Sources (more detail or larger scale)	Source Information Scale	NTS
103B	Peatlands of the Pacific coast-		1:250 000	all
103C	Preliminary Mapping by C. Tarnocai (22)			
103F	Peatlands of the Pacific Coast - Preliminary Mapping by C. Tarnocai (22)		1:250 000	all
		Agriculture Capability	1:50 000	1, 8, 9, 16
103G	Peatlands of the Pacific Coast - Preliminary Mapping by C. Tarnocai (22)		1:250 000	all
		Agriculture Capability	1:50 000	4, 5, 12, 13
103H	Peatlands of the Pacific Coast - Preliminary Mapping by C. Tarnocai (22)		1:250 000	W 1/2, SE
103I	Generalized Terrain: Skeena - Nass Strategic Planning Unit		1:250 000	all
	Soil Capability for Agriculture		1:125 000	parts of NE, S 1/2
	G.S.C. Surficial Geology M1557A (3)		1:100 000	parts of NE, S 1/s
		Terrain Maps	1:50 000	all
103J	Peatlands of the Pacific Coast - Preliminary Mapping by C. Tarnocai		1:250 000	S 1/2, NE
		Terrain Maps	1:50 000	1, 2, 7-11, 116
		Agriculture Capability	1:50 000	4
103K	Peatlands of the Pacific Coast - Preliminary Mapping by C. Tarnocai		1:250 000	S 1/2
		Agriculture Capability	1:50 000	1
103O,	Generalized Terrain: Skeena - Nass		1:250 000	all

Map Sheet	Sources Used for Map Compilation	Other Information Sources (more detail or larger scale)	Source Information Scale	NTS
103P	Strategic Planning Unit Soil Capability for Agriculture G.S.C. Surficial Geology M1557A (3)		1:125 000 1:100 000	parts of E 1/2, SW part of 1
		Terrain Maps	1:50 000	all of P, 01E, 08E, 09E, 016E
104A	Klappan Biophysical Project: Terrain Materials for Upper Nass - Iskut Area Terrain Materials for Northwest Klappan Area		1:250 000 1:250 000	1-15 16
		Terrain Maps	1:50 000	1-8
104B,	Klappan Biophysical Project:		1:250 000	1, 7-9
104C	Terrain Materials for Upper Nass - Iskut Area Soil Landscapes for Iskut Map Area		1:250 000	10-16
		Agriculture Capability	1:50 000	10-13
104F	Soil Landscapes for Telegraph Creek Map Area		1:250 000	E 1/2
		Agriculture Capability	1:50 000	parts of 4, 5, 11-15
		Stikine - Iskut Hydro-electric Project: Soil and Terrain Maps	1:50 000	parts of NW, E 1/2
104H	Klappan Biophysical Project: Terrain Materials for Northwest Klappan Area Soil Landscapes for Spatsizi Map Area Surficial Geology of Klappan Watershed (2)		1:250 000 1:250 000 1:100 000	1-10 11-16 parts of 2, 3, 6, 7, 11
		Stikine - Iskut Hydro-electric Project: Soil and Terrain Maps	1:50 000	part of NW

Map Sheet	Sources Used for Map Compilation	Other Information Sources (more detail or larger scale)	Source Information Scale	NTS
104I	Cry Lake Biophysical Inventory		1:250 000	all
		Stikine - Iskut Hydro-electric Project: Soil and Terrain Maps	1:50 000	part of SW
104HJ	Soil Landscapes for Dease Lake Map Area		1:250 000	all
		Agriculture Capability	1:50 000	part of 2
		Stikine - Iskut Hydro-electric Project: Soil and Terrain Maps	1:50 000	parts of 1-3, 7, 8
104K,	Insufficient data for compilation			
104L				
104M	Insufficient data for compilation			
104N	G.S.C. Open File 539		1:100 000	16
		Terrain Maps	1:20 000	parts of 5, 11, 12
104O	G.S.C. Open File 539		1:100 000	13, 14
104P	Liard River Hydro-electric Development: Soils, Surficial Geology and Landform Inventory (23)		1:100 000	15, 16
	G.S.C. Open File 594		1:100 000	15, 16
114O	Insufficient data for compilation			
114P	G.S.C. Surficial Geology M13-1981		1:100 000	NE

APPENDIX 5A
ORGANIC SOILS OF THE TULAMEEN MAP AREA (92H/NE)
(From Lord and Green, 1974)

THE COLEY MAP UNIT

The Coley complex consists of organic soils developed on slightly to moderately acid organic accumulations. These soils occur as small isolated units throughout the lower plateau at elevations of 1050 to 1250 metres. They cover about 2025 hectares.

The soils have developed from decomposed aquatic plants, sedges, reeds and shrubs that have accumulated in shallow depressions and channel fillings. The native vegetation is dominated by sedges and grasses. The typical plants are beaked sedge, reed grass, redtop, tall manna grass and willows. Topography is depressional to very gently sloping.

The Coley complex consists of the Coley series (typic mesisol), terric mesisols and gleysols.

Coley soils are very poorly drained. They have 15 to 20 centimetres of very dark brown, slightly alkaline surface layers of roots and leaves over dark brown sedmidecomposed plant remains.

Accumulations of marl frequently overlie the surface layers or are incorporated in the surface tier. A thin stratum of volcanic ash commonly occurs at depths of 30 to 45 centimetres from the surface.

Most Coley soils have some natural sustained grazing capacity. In places where drainage is improved these soils can support coarse grains, forage crops and hay.

THE ETCHES MAP UNIT

The Etches complex consists of organic soils developed on strongly acid organic materials. The soils occur in the upper plateau from elevations of 1350 metres up into the alpine region. They cover about 2900 hectares.

The partially decomposed organic materials are derived mainly from sedges and other aquatic plants. The strongly acidic plant remains are usually over 60 centimetres thick. Sedges dominate the native vegetation. Other plants include willows, Labrador tea, and scattered trees and shrubs along the margins of the bogs. The topography is nearly level and depressional.

The Etches complex consists of the Etches series (typic mesisol), terric mesisols and gleysols.

Etches soils are very poorly drained. The profile has 12 to 15 centimetres of fine roots, leaves and semidecomposed plant fibre (f) over dark brown, decomposed organic remains (m). At 60 centimetres fine sand layers commonly occur.

Limitations of climate and excessive wetness restrict Etches soils to native grazing by wildlife and domestic stock.

APPENDIX 5B TWO ORGANIC SOILS OF THE CARIBOO - CHILCOTIN REGION

CHIEF SOILS (from Lord and Green, 1985)

The Chief Association consists of Organic soils developed mainly on sedge peat materials, associated with fen types of peat landforms. The soils occupy depressional or very gently sloping areas generally below elevations of 1200 metres. The map areas are small and are in the Stony Lake section along the extreme eastern boundary of the plateau. They predominate in less than 1 per cent of the map area.

The mean annual precipitation is 300 to 750 millimetres. The frost-free period is 30 to 89 days and there are 780 to 1309 growing degree-days above 5 C.

The fens are mostly unforested, with a vegetative cover of sedges and grasses. Vegetation on bogs is black spruce, lodgepole pine, ericaceous shrubs and mosses. The soils are very poorly drained and have an aquic moisture regime.

The Chief Association includes a wide range of organic materials in various states of decomposition. Most profiles are classified as Mesisols but Fbrisols predominate in some areas. The surface tier of a typical profile is composed of 5 to 20 centimetres of fibric moss peat or sedge peat material that overlies more decomposed layers of dark brown, acidic organic materials.

Many soil areas of the Chief map unit are used by wildlife and for livestock grazing. Some units produce hay from native sedge vegetation or from seeded grasses.

RAIL SOILS (from Valentine and Lavkulich, 1978)

The Rail soils are a Mesisol from the central Interior. They have formed from the gradual infilling of lakes that occupied the depressions in the hummocky surface of the plateau. The following is an abbreviated description of such a soil taken in a meadow just south of 100-Mile House (51°3'N, 121°18'W). The vegetation is principally sedges and seaside arrowgrass with some moss. The meadow had been partially drained and the water table was at about 40 centimetres in July.

Of3	3 centimetres of poorly decomposed moss and sedge remains.
Om1	76 centimetres of brown, fairly well-decomposed sedge and moss remains.
Cm	3 centimetres of light grey volcanic ash.
Om2	55 centimetres of dark brown, moderately well-decomposed sedge and moss remains.

Chemical and Physical Analyses of a Mesisol (Rail Series)

Depth Horizon	pH (cm)	Org. (CaCl ₂)	% Total C	% C:N N	% Ratio	% Fibre	Bulk Density Ash	(g/cc)
Om1	3-79	6.9	50.9	2.94	17.3	57.7	12.2	0.118
C 79-82	7.3	1.7	0.35	4.8	-	97.1	-	
Om2	82-147	7.0	47.1	2.77	17.0	67.4	18.8	0.129

Cation exchange, meq./100 g soil

Horizon	Capacity	Ca	Mg	K	Na	Base Sath %	Water Holding Capacity %
Om1	163.2	61.7	103.5	1.5	6.0	100+	930.6
C	2.6	9.0	2.2	1.3	2.2	100+	-
Om2	102.8	46.4	64.8	1.5	6.5	100+	1113.9

APPENDIX 5C
ORGANIC SOILS OF THE NECHAKO - FRANCOIS LAKE MAP AREA
(93F/N 1/2, 93K/S 1/2)
(from Cotic et al., 1974)

Organic soils cover 25 380 hectares or 1.74 per cent of the map sheet. Almost all organic areas are in their natural state. They are used as pasture or resting places by moose and other wildlife. A few organic soils situated in basin lowlands and close to settlements are used for natural hay production.

Map Units

Symbol	Dominant Great Group	Significant Great Group	Comments
01	Fibrisol	Mesisol	This map unit is composed of sedge meadows with different degrees of wetness and inclusions of swampy areas or smaller open bodies of water. Combination of a sedge meadow and forest or shrub and moss-covered parts also occurs. Very often the rims of organic areas are forested with the middle part open sedge or bog.
02	Mesisol	Fibrisol	This map unit covers predominantly forested organic areas but inclusions of sedge meadows and some swampy areas regularly occur.

APPENDIX 5D
PROFILE DESCRIPTIONS OF TWO ORGANIC SOILS OF THE FORT ST.
JOHN - DAWSON CREEK MAP AREA
 (from Lord and Green, 1986)

KENZIE SOIL

Location: 54°59'N, 118°53'W

Fibrisol (1978) Drainage: very poorly drained

Landform and parent material: moss peat bog

Classification: Terric Mesic

Slope and aspect: level

Elevation: 670 metres

PROFILE DESCRIPTION

Horizon	Depth (cm)	Colour dry (m) moist (m)	Texture	Structure	Roots
Of1	0-30	reddish brown (5YR 4/4 m)		weakly layered	abundant
Of2	30-68	dusky red (2.5YR 3/2 m) and dark reddish brown (2.5YR 3/4 m)		spongy, non-woody moderately-strongly layered, compact, moderately woody	medium plentiful, medium
Om	68-93	yellowish red (5YR 5/6 m) and dark reddish brown (5YR 3/2m)	silt loam	very weakly layered, compact, slightly	few, fine woody
Cg	93-103	grey (5YR 5/1m); few fine, distinct mottles (10YR 5/6 m)	silty clay loam		very few, fine

CHEMICAL AND PHYSICAL DATA

Horizon	pH in CaCl ₂	Organic Total		C:N Ratio	Cation Exchange (meq/100 g)				
		C (%)	N (%)		CEC	Ca	Mg	K	Na
Of1	3.6	42.4	0.6	68	182.8	16.3	11.8	1.1	0.4
Of2	4.1	40.4	0.6	62	202.3	35.0	17.8	0.3	0.0
Om	5.2	45.7	1.0	46	212.0	67.2	28.2	0.1	0.3
Cg	5.9				19.2	7.9	4.4	0.6	0.1

Horizon	Particle-size Distribution(%)				Pyrophosphate		Fibre	
	Sand	Silt	Total Clay	Fine Clay	Colour (%)	Unrubbed	Rubbed (%)	Ash (%)
Of1					10YR 7/1	92	82	2
Of2					92	80		
Om					72	31	13	
Cg	10	62	28	1				

EAGLESHAM SOIL

Location: 54 44'N, 119°39'W
 Drainage: very poorly drained
 Landform and parent material: fen peat

Classification: Terric Fibric Mesisol (1978)
 Slope and aspect: depression
 Elevation: 910 metres

PROFILE DESCRIPTION

Horizon	Depth (cm)	Colour dry (m) moist (m)	Structure	Roots
Of1	0-10	brown (10YR 5/3 m)	strongly layered; compact; non-woody	abundant, fine and coarse
Om1	10-20	very dark greyish brown (10YR 3/2 m)	moderately layered; compact; non-woody	abundant, fine and medium
Of2	20-48	dark brown (7.5YR 4/4 m)	weakly layered; compact; non-woody	plentiful, fine and medium
Om2	48-60	dark brown (7.5YR 3/2 m)	weakly layered; compact; non-woody	few, fine and medium
Of3	60-90	dark brown (7.5YR 4/4 m)	strongly layered;very compact; non-woody	few, fine and medium
Cg	90-102	dark greyish brown (10YR 4/2 m)	silty clay loam amorphous; very friable	very few, fine

CHEMICAL AND PHYSICAL DATA

Horizon	pH in H ₂ O	Organic Total		C:N Ratio	Cation Exchange (meq/100 g)				
		C (%)	N (%)		CEC	Ca	Mg	K	Na
Of1	4.9	30.5	1.5	20	91.4	22.2	7.2	4.0	0.4
Om1	5.2	38.4	3.1	12	94.4	22.8	4.8	2.9	0.3
Of2	5.1	50.8	3.0	17	91.4	24.5	3.1	0.4	0.2
Om2	4.9	47.7	3.1	15	103.2	29.7	3.6	0.3	0.3
Of3	5.0	51.0	3.0	17	76.8	19.4	3.1	0.3	0.4
Cg	5.1	9.4	0.8	11	39.6	7.5	1.9	1.0	0.0

Horizon	Particle-size Distribution (%)				Pyrophosphate Colour (%)	Fibre (%)		Ash (%)
	Sand	Silt	Total Clay	Fine Clay		Unrubbed	Rubbed	
Of1					10YR 8/2	74	48	38
Om1					10YR 8/2	77	21	16
Of2					10YR 7/1	79	52	4
Om2					10YR 7/1	75	30	5
Of3					10YR 6/1	93	52	9
Cg	18	53	29	13				

APPENDIX 5E
AN ORGANIC SOIL OF THE FORT NELSON MAP AREA (94J/NE)
(from Valentine, 1971)

KLUA SOIL

The cryosolic soils within the zone of discontinuous permafrost in British Columbia are principally organic cryosols in the peatlands. One of the soils from the Klua complex east of Fort Nelson is taken as an example. It was described and sampled on an exposed road cut north of Clarke Lake (58°4'N, 122°9'W). In the bog away from the road cut, permafrost was at about 50 centimetres in late July. An abbreviated description follows:

- Of1 30 centimetres of yellowish brown, partially decomposed sphagnum and hypnum moss remains.
- Om 55 centimetres of dark brown, semidecomposed moss and leaf remains.
- Of2 65 centimetres of dark brown, partially decomposed moss and sedge remains.
- Ofz frozen, partially decomposed moss and sedge remains.

Chemical and Physical Analyses of an Organic Cryosol
(Klua Complex)

Horizon	Depth (cm)	pH (CaCl ₂)	% Org. C	% Total N	C:N Ratio	Bulk Density (g/cc)	Water Holding Capacity %	Fibre %
Of1	0-30	3.9	54.8	0.89	61.6	0.16	1656	87
Om	30-85	4.3	47.2	0.88	53.6	0.28	696	54
Of2	85-150	5.4	52.8	1.68	31.4	0.16	1060	73
Ofz	150+	5.9	52.9	2.42	21.9	-	-	82

APPENDIX 6

PEATLAND INVENTORY INDEX MAP

List of 1:250 000 scale Inventory Maps
(available separately and individually from this report)

The map displays the Queen Elizabeth Islands, a group of islands in the Arctic region. Key features include:

- Islands and Reefs:** Labeled with codes such as Bs^1 , Bs^2 , Bs^3 , Bs^4 , Bs^5 , Bs^6 , Bs^7 , Bs^8 , Bs^9 , Bs^{10} , Bs^{11} , Bs^{12} , Bs^{13} , Bs^{14} , Bs^{15} , Bs^{16} , Bs^{17} , Bs^{18} , Bs^{19} , Bs^{20} , Bs^{21} , Bs^{22} , Bs^{23} , Bs^{24} , Bs^{25} , Bs^{26} , Bs^{27} , Bs^{28} , Bs^{29} , Bs^{30} , Bs^{31} , Bs^{32} , Bs^{33} , Bs^{34} , Bs^{35} , Bs^{36} , Bs^{37} , Bs^{38} , Bs^{39} , Bs^{40} , Bs^{41} , Bs^{42} , Bs^{43} , Bs^{44} , Bs^{45} , Bs^{46} , Bs^{47} , Bs^{48} , Bs^{49} , Bs^{50} , Bs^{51} , Bs^{52} , Bs^{53} , Bs^{54} , Bs^{55} , Bs^{56} , Bs^{57} , Bs^{58} , Bs^{59} , Bs^{60} , Bs^{61} , Bs^{62} , Bs^{63} , Bs^{64} , Bs^{65} , Bs^{66} , Bs^{67} , Bs^{68} , Bs^{69} , Bs^{70} , Bs^{71} , Bs^{72} , Bs^{73} , Bs^{74} , Bs^{75} , Bs^{76} , Bs^{77} , Bs^{78} , Bs^{79} , Bs^{80} , Bs^{81} , Bs^{82} , Bs^{83} , Bs^{84} , Bs^{85} , Bs^{86} , Bs^{87} , Bs^{88} , Bs^{89} , Bs^{90} , Bs^{91} , Bs^{92} , Bs^{93} , Bs^{94} , Bs^{95} , Bs^{96} , Bs^{97} , Bs^{98} , Bs^{99} , Bs^{100} .
- Geographical Features:** CREASE RANGE, MCKAY RANGE, GRAHAM MOUNTAIN, JUSKATLA MOUNTAIN, PROVINCIAL ISLAND.
- Points of Interest:** Hope Pt, Morgan Pt, Frederik Island, Ellis Point, Kennicott Point, Joseph Rocks, Tian Head, Tian Rk, Tian Islets, Michel Pt, Chanal Point, Louis Pt, Gillan Pt, Huggins Pt, Selwyn Pt, Marchand Pt, Hippa Island, Skell Pt, Sadler Pt, Cornet Pt, Kuntana Pt, Farnet Pt, Chittenden Point, Kwanan, McCraith I, Wathus Island, Learmonth, Seegay, Juskatla Mountain.
- Coordinates:** The map includes a coordinate grid with latitude and longitude markings.

CANADA

EDITION 2

103 F



Province of British Columbia Ministry of Energy, Mines and Petroleum Resources
 Energy, Mines and Resources Canada Énergie, Mines et Ressources Canada

THIS PROJECT IS A CONTRIBUTION TO THE CANADA / BRITISH COLUMBIA MINERAL DEVELOPMENT AGREEMENT 1985 - 1990

Ministry of Energy Mines and Petroleum Resources
 GEOLOGICAL SURVEY BRANCH

Map to accompany:

**PEATLAND INVENTORY
 OF BRITISH COLUMBIA
 OPEN FILE 1988-33**

By D.E. MAYNARD

PEATLAND INVENTORY

103 F

MAP LEGEND

- O - undifferentiated organic
- OV - shallow, undifferentiated organic (40-100 cm.)
- Ob1 - greater than 1 metre undifferentiated organic; poorly to moderately decomposed
- Ob2 - greater than 1 metre undifferentiated organic; moderately to well decomposed
- O1 - poorly to moderately decomposed, undifferentiated organic
- O2 - moderately to well decomposed, undifferentiated organic
- B - bog
- Bs - slope bog; variable depth; sphagnum surface
- Bv - shallow bog (40-100 cm.); sphagnum surface
- Bd - deep bog (greater than 1 m.); sphagnum surface
- F - fen
- Fv - shallow fen (40-100 cm.)
- Fd - deep fen (greater than 1 m.)
- FB - fen-bog complex; variable depth and degree of decomposition

Notes

- designates peatlands less than 50 hectares; if no adjacent symbol then it indicates undifferentiated organic
- X modifiers attached after peatland symbols
- K frozen peatland

CHARLOTTE

ISLANDS

PROVINCIAL

ISLAND

MOUNT
BEGBIE

JUSKATLA
MOUNTAIN

OLD
BALDY

Chart
Island

Buck Pt

Kilgore Pt

Tcanakun Pt

Ellis Pt

Tana Pt

Gagi Rk

Marble
Island

Stu Rk

Van Pt

Hunter
Point

Fame Pt

Cadman I

Kano Pt

Kindakun Pt

Cone Head

Richardson
Head

Gospel Pt

Gospel
Island

Clapp

Shields

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BS²

BS³

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BS¹²

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CHARLOTTE

ISLANDS

ISLAND
PROVINCIAL

FOREST

MOUNT
STAPLETON

Moresby Provincial
Moresby Island

FOREST

- O - undifferentiated organic
Ov - shallow, undifferentiated organic (40-100 cm.)
Ob1 - greater than 1 metre undifferentiated organic; poorly to moderately decomposed
Ob2 - greater than 1 metre undifferentiated organic; moderately to well decomposed
O1 - poorly to moderately decomposed, undifferentiated organic
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B - bog
Bs - slope bog; variable depth; sphagnum surface
By - shallow bog (40-100 cm.); sphagnum surface
Bb - deep bog (greater than 1 m.); sphagnum surface
F - fen
Fv - shallow fen (40-100 cm.)
Fb - deep fen (greater than 1 m.)
FB - fen-bog complex; variable depth and degree of decomposition

Notes

- designates peatlands less than 50 hectares; if no adjacent symbol then it indicates undifferentiated organic

modifiers attached after peatland symbols

-X frozen peatland

-D peatland disturbed by mining

EXAMPLE OF MAP SYMBOL

O¹B² percent distribution of organic within map polygon

i.e. 60% undifferentiated organic and 20% bog; if no percent given then peatland unit covers 100% of the polygon.

SOURCES OF INFORMATION

Map Scale HTS

1. Peatlands of the Pacific Coast;
Preliminary Mapping by C. Ternocai

1:250,000 all

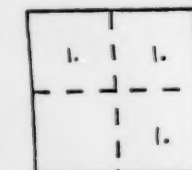
OTHER INFORMATION SOURCES

(more detail or larger scale)

- Agricultural Capability

1:50,000 1/8, 9, 16

KEY TO MAP SYMBOLS

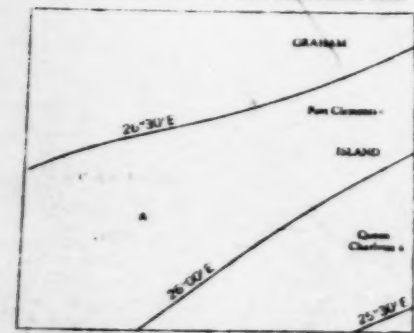


TEN THOUSAND METRE
UNIVERSAL TRANSVERSE MERCATOR GRID
ZONE 8



THE DECLINATION OF THE COMPASS NEEDLE, 1960.

Compiled from large scale maps.
Produced by the ARMY SURVEY ESTABLISHMENT, R.C.E. 1958-61



The declination of the compass needle at any place along a red line is the declination given on that red line. At other places the declination is between those given on the neighbouring red lines, thus at the place marked A, the declination is between 26°00' E. and 26°30' E. The declination of the compass needle is decreasing 3 minutes annually.

REFERENCE

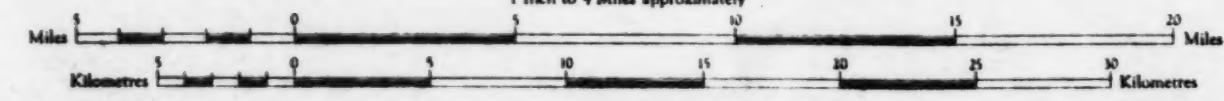
Roads	more than 2 lanes	Bar
hard surface, all weather	2 lanes	Bar
hard surface, all weather	3 lanes or more	Bar
loose surface, all weather	less than 2 lanes	Bar
loose surface, all weather		Bar
dry weather		Bar
cart track, trail, or cut line		Bar
Railways		Bar
normal gauge, multiple track		Bar
normal gauge, single track		Bar
abandoned or under construction		Bar
Power line, Telephone line		Bar
Boundaries		
international, with monument		Bar
provincial		Bar
county or district		Bar
township or parish		Bar
township or parish, unsurveyed		Bar
park, reserve, etc.		Bar
Horizontal control point, with elevation	982	Bar
Bench mark, with elevation	9025	Bar
Spot elevation, precise, approximate	9582 7375	Bar
Historical site, Cemetery		Bar
Mine or open cut, Quarry		Bar

GRAHAM ISLAND

QUEEN CHARLOTTE DISTRICT

BRITISH COLUMBIA

Scale 1 : 250,000
1 Inch to 4 Miles approximately



Copies may be obtained from
The Map Distribution Office,
Dept. of Mines and Technical Surveys,
Ottawa

REFERENCE

City or large town		Forest
Town, 2000 to 10,000 population		Wharf
Town, 500 to 2000 population		Lock
Village or settlement		Ferry
Post Office, School, Church		Swamp
Radio Station, Tower		Inter
Well, Tank		Inde
Lighthouse		Rap
Contours		Arpe
elevation		Arke
depression		Seap
approximate		Wood

Contour Interval 500
Elevations in Feet above Mean
Transverse Mercator Projection
North American Datum



SOURCES OF INFORMATION Map Scale: **NTS**

1. *Reallands of the Pacific Coast; Preliminary Mapping by C. Tarnocai* 1:250,000 all

OTHER INFORMATION SOURCES
(more detail or larger scale)

- *Agricultural Capability* 1:50,000 1, 8, 9, 16

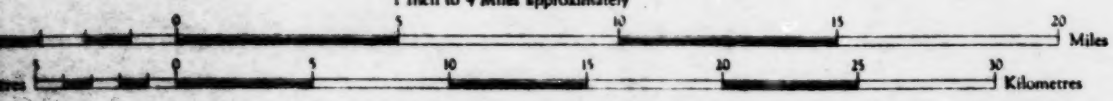
KEY TO MAP SOURCES

TEN THOUSAND METRE
UNIVERSAL TRANSVERSE MERCATOR GRID
ZONE 8

GRAHAM ISLAND

QUEEN CHARLOTTE DISTRICT
BRITISH COLUMBIA

Scale 1 : 250,000
1 Inch to 4 Miles approximately

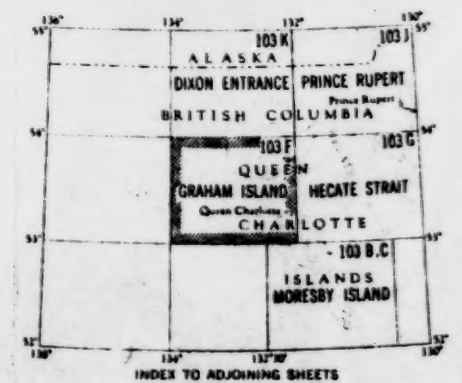


Copies may be obtained from
The Map Distribution Office,
Dept. of Mines and Technical Surveys,
Ottawa.

Contour Interval 500 Feet
Elevations in Feet above Mean Sea Level
Transverse Mercator Projection
North American Datum 1927

REFERENCE

- | | | | |
|----------------------------------|--|------------------------------|--|
| City or large town | | Foreshore flats | |
| Town, 2,000 to 10,000 population | | Wharf or pier, breakwater | |
| Town, 500 to 2,000 population | | Lock, small, large | |
| Village or settlement | | Ferry | |
| Post Office, School, Church | | Swamp or marsh | |
| Radio Station, Tower | | Intermittent lake, stream | |
| Well, Tank | | Indefinite shoreline, stream | |
| Lighthouse | | Rapids, large, small, Bridge | |
| Contours: | | Airport | |
| elevation | | Airfield or landing ground | |
| depression | | Seaplane base, anchorage | |
| approximate | | Wooded area | |



GRAHAM ISLAND
103 F
EDITION 2